
SDMS US EPA REGION V -1

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DOCUMENTS.**

153760

I N D E XMATERIAL SAFETY DATA SHEETS

<u>TRADE NAME</u>	<u>MANUFACTURER</u>
1 - Chlorethene V.G. (Methyl Chloroform, Trichloroethane)	Dow
2 - Dichloromethane (Methylene Chloride)	Dow
3 - Trichloroethylene	Diamond Shamrock Chemical Co. Detrex Chemical
4 - SOL 140 or ESPSOL 350-66	Shell Chemical Co.
5 - XL99 Electrical Cleaning Solvents	Malter
6 - Nalco 749	Nalco Chemical Co.
7 - Nalco 310	Nalco Chemical Co.
8 - Nalpac 8241	Nalco Chemical Co.
9 - Nalco 19 Ball	Nalco Chemical Co.
10 - Mogul WS - 164	Mogul
11 - Mogul WS - 128	Mogul
12 - Mogul A-421	Mogul
13 - Mogul HP-280	Mogul
14 - Mogul CL-630	Mogul
15 - Weld On 710	Industrial Poly Chemical
16 - Weld On 715	Industrial Poly Chemical
17 - 480 Series Rigiflakes	Heil
18 - Mineral Spirits	Independent Petro chemical
19 - Hydrocarbon Solvents	General Info Charter Chemical
20 - IPC 1258	Independent Petro chemical
21 - General Info Sheets on Hyd. Fluids/Soluble Oil	G. Whitfield Richards

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<u>VOID</u>	<u>TRADE NAME</u>	<u>MANUFACTURER</u>
22	- Flash Points - Drawing Compounds	Etna Products
23	- CC5050	Waste Research and Reclamation Co.
24	- Johnson J-306	Johnson Chemical Co.
25	- Trisodium Phosphate - Crystalline	Olin
26	- S. S. Alunite Mold Wash	Ostler
27	- Berkeley 120 Mesh Supersil	Penn. Glass & Sand Corp.
28	- Johnson Cleaner Swipe 129,229	Johnson Chemical Co.
	- Ridge Nu-Clear	Ridge Tool Co.
	- Ridge Dark Cutting Oil	Ridge Tool Co
	- Mogul 9165A	Mogul Corp.
32	- Mogul EG-5522	Mogul Corp.
33	- Mogul WS-123	Mogul Corp.
34	- Mogul CL-631	Mogul Corp.
35	- Mogul AG-471	Mogul Corp.
	- Bactericide X-cide 215 & X-cide-102	Tretolite
	- Mobilmet S122	Mobil
38	- Phosphoric Acid	Monsanto
39	- Muriatic Acid/Hydrochloric Acid	Monsanto
40	- Thiourea	Sakai Chemical Ind. Co.
41	- Sulframin 85 Flakes & Powder	Witco Chemical
42	- Acetone	Independent Petrochemical
43	- Heavy Oxo Ends	Monsanto
44	- Avitone	Du Pont
45	- Glue 69 & 2268	Swift
46	- Wed-129	Panco

*Rec'd from Paul Crompton, Chemist, Independent
Tetrachemical Co. 1/19/78*

(2 cont.)

M A T E R I A L S A F E T Y D A T A S H E E T PAGE: 1
DOW CHEMICAL U.S.A. MIDLAND MICHIGAN 48640 EMERGENCY PHONE: 517-636-4400
EFFECTIVE DATE: 26 JAN 76 DATE PRINTED: 23 MAY 77 PRODUCT CODE: 55590
PRODUCT NAME: METHYLENE CHLORIDE, TECH. MSD: 0009

INGREDIENTS (TYPICAL VALUES) : % :
METHYLENE CHLORIDE, ESSENTIALLY : 100 :

SECTION 1

PHYSICAL DATA

BOILING POINT: 104F (39.8C) : SOL. IN WATER: 2.0G/100G @ 25C
VAP PRESS-MMHG @ 20C: 340 : SP. GRAVITY: 1.320 @ 25/25C
VAP DENSITY (AIR=1): 2.93 : % VOLATILE BY VOL: 100 (ESSENT.)
APPEARANCE AND ODOR: COLORLESS LIQUID

SECTION 2

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: NONE : FLAMMABLE LIMITS (STP IN AIR)
METHOD USED: TOC, TCC, COC : LFL: SEE SEC. 3+ UFL: SEE SEC. 3+
EXTINGUISHING MEDIA: WATER FOG, NON-FLAMMABLE
SPECIAL FIRE FIGHTING EQUIPMENT AND HAZARDS: SELF-CONTAINED RESPIRATORY
EQUIPMENT.

SECTION 3

REACTIVITY DATA

STABILITY: STABLE
CONDITIONS TO AVOID: +SEE JOURNAL OF CHEMICAL AND ENGINEERING DATA 17
(1) 89-93 (1972) FOR FLAMMABILITY LIMITS AT OTHER THAN STANDARD
TEMPERATURE AND PRESSURE.
INCOMPATIBILITY: ----
HAZARDOUS DECOMPOSITION PRODUCTS: OPEN FLAMES AND WELDING ARCS CAN CAUSE
THERMAL DEGRADATION WITH THE EVOLUTION OF HYDROGEN CHLORIDE AND VERY
SMALL AMOUNTS OF PHOSGENE AND CHLORINE.
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.
CONDITIONS TO AVOID: ----

SECTION 4

SPILL, LEAK, AND DISPOSAL PROCEDURES

ACTION TO TAKE FOR SPILLS (USE APPROPRIATE SAFETY EQUIPMENT): SMALL SPILLS:
MOP UP, WIPE UP OR SOAK UP IMMEDIATELY. REMOVE TO OUT OF DOORS.
LARGE SPILLS: EVACUATE AREA. CONTAIN LIQUID; TRANSFER TO CLOSED

(CONTINUED ON PAGE 2)

M A T E R I A L S A F E T Y D A T A S H E E T P A G E : 3
DOW CHEMICAL U.S.A. MIDLAND MICHIGAN 48640 EMERGENCY PHONE: 517-636-4400
PRODUCT (CONT'D): METHYLENE CHLORIDE, TECH. PRODUCT CODE: 55590
MSD: 0009

SECTION 7 SPECIAL HANDLING INFORMATION (CONTINUED)

VENTILATION: LIMIT CONCENTRATION IN AIR TO TLV.
RESPIRATORY PROTECTION: BELOW 200 PPM - NONE; RESPIRATORY PROTECTION
REQUIRED IN THE ABSENCE OF ENVIRONMENTAL CONTROL. FOR LEVELS UP TO 2%
FOR 1/2 HOUR OR LESS, A SUITABLE FULL-FACE MASK WITH ORGANIC CANISTER
SHOULD BE USED. ABOVE 2% AND FOR EMERGENCIES, USE A SELF-CONTAINED
BREATHING APPARATUS.
PROTECTIVE CLOTHING: NO SPECIAL PROTECTIVE CLOTHING NEEDED.
EYE PROTECTION: SAFETY GLASSES WITHOUT SIDE SHIELDS. EYE WASH STATIONS
AND SAFETY SHOWERS SHOULD BE READILY AVAILABLE.

SECTION 8 SPECIAL PRECAUTIONS OR COMMENTS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: EXERCISE REASONABLE
CARE AND CAUTION. AVOID BREATHING VAPORS. STORE IN COOL PLACE.

ADDITIONAL INFORMATION: ----

LAST PAGE

THE INFORMATION HEREIN IS GIVEN IN GOOD FAITH, BUT NO WARRANTY,
EXPRESSED OR IMPLIED, IS MADE.

recd 1/19/78

CHLORINATED SOLVENTS

Toxicity, Handling Precautions, First-Aid



CHLORINATED SOLVENTS

Toxicity, Handling Precautions, First-Aid

Toxicity

Trichloroethylene, perchloroethylene, 1,1,1-trichloroethane and methylene chloride solvents are similar in their effects whether the exposure is by oral ingestion, eye or skin contact. They are all low in oral toxicity. They all produce slight irritation but no serious injury when splashed into the eye.

They all can defat the skin and may produce dermatitis from frequent daily contact, and may produce a burn if confined to the skin. Occasional brief contact with the skin is not likely to produce effects.

Although they all produce an anesthetic effect upon inhalation, the concentration required varies significantly, leading to different exposure limits.

There is little or no likelihood of any of these solvents producing chronic toxic effects from repeated exposure at levels below those required to produce acute anesthetic effects. However, it should be noted that methylene chloride exposures can result in some increase of carboxyhemoglobin levels in the blood. This is an effect similar to that when inhaling carbon monoxide in cigarette smoke. Although these products are similar in toxic properties, 1,1,1-trichloroethane offers comparatively more safety.

DOW Perchloroethylene SVG has been specifically developed as an outstanding solvent for the vapor degreasing of metals. It is intended for that use only; and because the stabilizers may cause skin sensitivity, it should not be used in operations where skin contact will occur, such as drycleaning or cold cleaning.

Chlorinated solvent vapors are heavier than air, and they tend to concentrate in low unventilated spaces such as degreaser tanks and pits. Entry into degreasers, tanks and other vessels, without proper protective equipment and proper breathing apparatus, could result in exposure to extremely high vapor concentrations which may cause dizziness, unconsciousness and death. Any problem concerning solvent handling or equipment maintenance should be referred to your solvent representative.

As with most volatile organic solvents, chlorinated solvents at concentrations producing "drunkenness" or unconsciousness may sensitize the heart to epinephrine and similar drugs (see Note to Physicians, page 2). This may result in cardiac arrhythmias, including ventricular fibrillation (a particular kind of irregular heart beat). Ventricular fibrillation could also result from stress induced secretion of natural body stores of adrenaline such as would occur during periods of fright, accompanied by sudden physical activity.

Handling

It is essential that all persons responsible for the operation or maintenance of a solvent degreaser, and all others who may come in repeated contact with these solvents, be thoroughly trained in the proper handling of the solvent and the equipment in which it is used. They should be cognizant of the hazards, the First Aid treatment prescribed in case of accidents, and proper use of protective equipment to safeguard health and promote maximum safety.

Safety Rules

1. Wear protective garments and use protective equipment when exposure cannot be avoided by good operating procedures.
2. Do not use solvent in open containers unless adequate ventilation is provided to draw the vapors away from the working area.
3. Avoid the possibility of exposing the solvent to excessive heat (such as welding operations).
4. A continuing strong or objectionable odor should not be tolerated. It is an indication of excessive solvent vapor in air. The odor of chlorinated solvents *cannot be relied on* as the only indicator of overexposure. Measurement of solvent concentrations in air must be made to assure safety of workmen and compliance with regulations (such as the Federal Occupational Safety and Health Act of 1970). An individual who becomes light-headed or dizzy in a solvent area should leave the area immediately.
5. Avoid prolonged or repeated contact with the skin.
6. Do not take internally.
7. Do not smoke while handling chlorinated solvents.
8. Place contaminated solvent in a suitable container and dispose of through a reclaimer, incineration or sanitary landfill burial, whichever is appropriate, in compliance with all governmental regulations.
9. Clean up small spillage and leakage immediately, placing solvent-laden rags in a closed container or outdoors until thoroughly dry. Major spills will require the use of respiratory protection as described on page 3 under Maintenance Men's Equipment.
10. Label all containers of chlorinated solvents to identify the material and indicate the hazards involved in its use.
11. Do not enter a degreaser or storage tank or any other vessel without assurance of complete aeration and use of a rescue harness with life-line. A second, outside man must be present to observe the man inside at all times.

Health Hazards and Treatment

ROUTE OF EXPOSURE	RESULT	HANDLING PROCEDURE	FIRST AID
SKIN	Frequent daily contact can defat tissue and may cause dermatitis. If solvent is confined to the skin, so that it cannot evaporate, a burn may result. Occasional contacts of short duration are not likely to have adverse effects.	Use neoprene or neoprene coated gloves, and discard when evidence of deterioration appears. Polyvinyl alcohol gloves are satisfactory.	If skin is exposed, remove soaked clothing and wash skin with running water. Do not wear soaked clothing until it is thoroughly dried.
EYES	Undiluted solvent, when splattered into the eyes, produces only slight irritation which clears within hours. No serious injury results, but appreciable discomfort is caused.	Use safety glasses or their equivalent.	Flush eyes thoroughly with large amounts of water. Obtain medical attention if irritation persists.
ORAL	Swallowing of solvent presents no problem in ordinary industrial handling. The swallowing of substantial quantities may cause illness.	Never store in unlabeled or improperly labeled container.	Call a physician promptly if large amounts are swallowed. As an emergency measure, induce vomiting by sticking a finger down the throat or by compelling the patient to drink lukewarm salt water or warm soapy water. In case of unconsciousness follow procedures below.
INHALATION. (RESPIRATORY TRACT)	Inhalation of excessive amounts of solvent vapor may produce an anesthetic effect. For some solvents, prolonged inhalation of excessive vapor concentrations may cause organic injury. Hence, exposure to excessive solvent vapor concentrations should be avoided. Death can result if too much is breathed.	Use of gas masks, hose masks or self-contained breathing apparatus, may be necessary depending upon operation. Where cleaning requires entering tanks and confined places such protection is essential and standard safety practices must be followed. Some spraying applications may require similar precautions. See "Safety Equipment," page 3.	Remove to fresh air, obtain medical attention at once. If breathing stops, artificial respiration should be used. Mouth to mouth is the most effective and easiest method. When breathing starts, oxygen should be administered. If the heart has stopped, give closed-chest cardiac massage, but only if properly trained to recognize and treat this condition. TO THE PHYSICIAN: Epinephrine and other drugs with similar activity on the heart may produce serious arrhythmias and should never be given to a person overcome with any chlorinated hydrocarbon, particularly when there is coexistent anoxia.

SPECIAL CAUTION—ENTRY INTO DEGREASERS, TANKS, VESSELS

Chlorinated solvent vapors are heavier than air, and they tend to concentrate in enclosures such as degreasing tanks and pits. Entry into degreasers, tanks and other vessels, without proper protective equipment and proper breathing apparatus, could result in exposure to extremely high vapor concentrations which may cause dizziness, unconsciousness and death. Any problem concerning solvent handling or equipment maintenance should be referred to your solvent representative.

Selection of Operators

There are no special or specific physical requirements for operating a vapor degreaser or handling solvents.

No one should be permitted to remain in the area contaminated by a leaking or otherwise malfunctioning degreaser regardless of his health status. Improperly operating equipment is a health hazard for anybody.

Safety Equipment

Safety garments and protective equipment should be provided to safeguard the health and assure the safety of degreaser operators and maintenance men and all other persons working with solvents. Such garments are not intended to substitute for proper operation and maintenance practices. The equipment manufacturer's instructions should be followed at all times.

Operator's Garments and Equipment

Gloves: polyvinyl alcohol plastic or neoprene.

Apron: polyvinyl alcohol plastic or neoprene.

Eye Protection: safety glasses or equivalent.

NOTE: PVA plastic, though solvent resistant, is soluble in water.

Maintenance Men's Equipment

Goggles: splash-proof.

Rescue harness and lifeline (for entering tank or enclosed space).

Air line masks with proper reduction valves and filters OR self-contained breathing equipment with stored oxygen or air OR approved industrial gas masks with canisters suitable for use with chlorinated solvent vapors.

Approved industrial gas masks are permissible for use in vapor concentrations of less than 2% and where there is no deficiency of atmospheric oxygen. They should not be used for exposures exceeding one-half hour.

SOLVENT ODOR, VAPOR INHALATION EFFECTS & OSHA EXPOSURE LIMITS¹

Chemical Name	SOLVENT ODOR ^{2,3}			VAPOR INHALATION EFFECTS ²				OSHA EXPOSURE LIMITS		
	Barely Detectable	Slight, Not Unpleasant	Strong, Unpleasant	None	Eye Irritation	Respiratory Irritation	Anesthetic (Light-Headed, Dizzy)	8-Hour Time-Weighted Average ⁴	Acceptable Ceiling Concentration ⁴	Acceptable Maximum Peak ⁴
Perchloroethylene	50	150	400	100 8 hrs	400	600	200, 8 hrs; 400, 2 hrs; 600, 10 min	100	200	300, 5 min in any 3 hrs
Trichloroethylene	100	200	600	100, 8 hrs daily, 5 days: 200, 3 hrs	400, slight; 1000, definite	1000	400, 20 min; 1000, 6 min 1500, <5 min	100	200	300, 5 min in any 2 hrs
1,1,1-Trichloroethane	100	350	1500	500, 7 hrs daily, 5 days	1000	2000	1000, 30-70 min; 1500, 15-60 min; 2000, 5 min	350	5	5
Methylene Chloride	310	200-800	1500				900-1200, 20 min; 2300, 5 min	500 ⁶	1000 ⁶	2000, 5 min in any 2 hrs ⁶

¹ All values in the table are in parts per million and were in effect as of October, 1976.

² Dow's Medical Research Laboratory is the source for odor data for the listed solvents except methylene chloride, for which the source is Lehman, K. B., and Flury, F., *Toxicology and Hygiene of Industrial Solvents* (Baltimore, 1943).

³ See Safety Rule 4, page 1.

⁴ 8-Hour Time Weighted Average is an employee's permissible average exposure in any 8-hour work shift of a 40-hour work week. The Acceptable Ceiling Concentration is the maximum concentration to which the worker may be exposed during the shift, except that brief excursions to a higher level (the Acceptable Maximum Peak) are permissible.

⁵ No limits established by OSHA. Dow recommends a Ceiling Concentration of 500 ppm and a Maximum Peak of 800 ppm for 5 minutes in any 2 hours based on Z37.26-1970 of the American National Standards Institute, Inc.

⁶ The American Conference of Governmental Industrial Hygienists has adopted 200 ppm as its recommended 7- or 8-hour time weighted average exposure for methylene chloride. Dow also recommends 200 ppm for the TWA and 500 ppm (average for any 15 minutes) as the Ceiling Concentration (no Maximum Peak).

DECOMPOSITION HAZARDS

Chlorinated solvents should not be used where vapors in concentrations of a few parts per million or more will contact very hot surfaces. In contact with open flames and/or hot surfaces, chlorinated solvents may be decomposed with the formation of hydrogen chloride, carbon dioxide, carbon monoxide and phosgene. The irritant action of hydrogen chloride gives warning of such decomposition under most practical conditions, thus, making the atmosphere irritating before enough phosgene has formed to become dangerous. The principal problem is corrosion of metal surfaces contacted by such decomposition products.

Don't arc weld in any area where there may be chlorinated solvents vapors. The ultraviolet rays given off by arc welding decompose the chlorinated solvents, creating toxic gases. Trichloroethylene and perchloroethylene, when present in air near arc welding operations, may be decomposed to produce a dangerous quantity of phosgene. With these solvents,

hydrogen chloride and chlorine, although formed in substantial amounts, may not always provide an adequate odor warning against the presence of phosgene.

If hot processes (such as welding operations) must be located in an area where there is the likelihood of solvent vapors, the products of combustion should be vented outside the building through corrosion resistant ducts. Similarly, where solvent vapors are present, air for combustion in space heaters, heat treating furnaces, etc. should be drawn from the outside atmosphere.

Concern for Environment

Legislation for the protection of the atmosphere will have an increasing effect on the choice of degreasing solvents. Regulations have been put into effect by cities, by states and by the Federal Government (The Clean Air Act of 1970 and the Occupational Safety and Health Act, 1970). Seek local counsel for compliance with local laws.

AVAILABLE LITERATURE CONTAINING SAFETY INFORMATION ON CHLORINATED SOLVENTS

1. Dow Chlorinated Solvents and the
Occupational Safety & Health Act Form No. 100-5270
2. What Every Drycleaner Should Know
About Perchloroethylene Form No. 100-5437
3. DOW Methylene Chloride Form No. 100-182
4. DOW Methylene Chloride,
Vapor Degreasing Grade Form No. 100-5641
5. DOW Methylene Chloride,
Urethane Grade Form No. 100-5445
6. AEROTHENE* MM Solvent for Aerosols Form No. 100-5615
7. CHLOROTHENE* NU Solvent Form No. 100-71
8. DOW Perchloroethylene SVG Form No. 100-272
9. CHLOROTHENE* VG* Technical Manual Form No. 100-5436
10. DOWPER* Drycleaning Solvent Form No. 100-61

* Trademark of The Dow Chemical Company

Dow and Product Stewardship

Dow encourages its customers to review their applications of Dow products from the standpoint of human health and environmental quality. To help ensure that Dow products are not used in ways for which they are not intended or tested, Dow personnel are willing to assist customers in dealing with ecological and product-safety considerations. Your Dow salesman can arrange the proper contacts.

CHLORINATED SOLVENTS

Toxicity, Handling Precautions, First-Aid

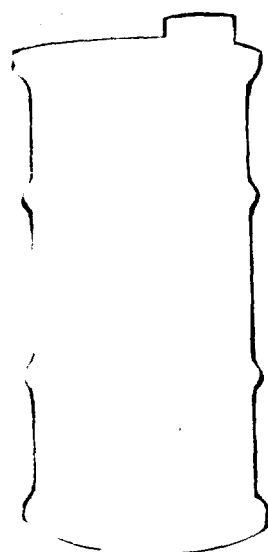
DOW CHEMICAL U.S.A. SALES OFFICES

ATLANTA	Suite 2005, 20 Perimeter Center East, Atlanta, GA	30346 • 394-4141
BATON ROUGE	4150 S. Sherwood Forest Blvd., Suite 101, Baton Rouge, LA	70816 • 293-2222
BOSTON	20 William St., Wellesley, MA	02181 • 237-2070
BUFFALO	Suite 343, 5500 Main St., Williamsville, NY	14221 • 631-5540
CHARLOTTE	2 Woodlawn Green, Woodlawn Road, Charlotte, NC	28210 • 525-9030
CHICAGO	1400 East Touhy Ave., Des Plaines, IL	60018 • 391-4700
CINCINNATI	Whitehall Park, 8050 Hosbrook Road, Cincinnati, OH	45236 • 793-6200
CLEVELAND	14955 Sprague Road, P.O. Box 8800, Strongsville, OH	44136 • 826-6000
DALLAS	12700 Park Central Place, Suite 600, Dallas, TX	75251 • 387-2211
DETROIT	Travelers Tower, Suite 415, 26555 Evergreen Road, Southfield, MI	48076 • 358-1300
GRAND RAPIDS	611 Cascade West Parkway S.E., Grand Rapids, MI	49506 • 949-9000
HOUSTON	P. O. Box 3387, Attn: Sales Office, Houston, TX	77001 • 626-3170
INDIANAPOLIS	Executive North, 941 East 86th St., P.O. Box 68511, Indianapolis, IN	46268 • 257-5271
KANSAS CITY	Suite 160, 10890 Benson Drive, Shawnee Mission, KS	66210 • 341-2500
LOS ANGELES	P. O. Bin 48, Pasadena, CA	91109 • 577-1515
MEMPHIS	Suite 2210, 5100 Poplar Ave., Memphis, TN	38137 • 767-5000
MINNEAPOLIS	4901 West 77th St., Minneapolis, MN	55435 • 835-4200
NEW YORK	Park 80 Plaza East, Saddle Brook, NJ	07662 • 845-5000
PHILADELPHIA	P. O. Box 350, Moorestown, NJ	08057 • 234-0400
PITTSBURGH	Four Gateway Center, Suite 1313, Pittsburgh, PA	15222 • 281-3030
RICHMOND	1603 Santa Rosa Road, Richmond, VA	23288 • 288-1601
ST. LOUIS	800 Pierre Laclede Center, 7733 Forsyth Blvd., St. Louis, MO	63105 • 726-5000
SAN FRANCISCO	2800 Mitchell Drive, Walnut Creek, CA	94596 • 944-2000
SEATTLE	777—106th St., N. E., Bellevue, WA	98004 • 455-7250
STAMFORD	Washington Plaza, 1351 Washington Blvd., Stamford, CT	06902 • 359-3300

NOTICE—The information and recommendations herein are, to the best of Seller's knowledge, accurate and reliable, and Seller's products mentioned are reasonably fit for the purposes so recommended. However, as use conditions are not within its control, Seller does not guarantee results from use of such products or other information herein. Freedom from patents of Dow or others is not to be inferred. Inasmuch as any assistance furnished by Dow with reference to the safe use and disposal of its products is provided without charge, Dow assumes no obligation or liability therefor, except to the extent that any such assistance shall be given in good faith.

DOW CHEMICAL U.S.A.
AN OPERATING UNIT OF THE DOW CHEMICAL COMPANY
INORGANIC CHEMICALS DEPARTMENT
MIDLAND, MICHIGAN 48640





Dow Methylene Chloride . . . the versatile solvent
to help you create better products

Rec'd 1/19/75

DOW

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METHYLENE CHLORIDE

Methylene chloride was first marketed by the Western Division of The Dow Chemical Company, known then as the Great Western Electro-Chemical Company. This solvent was soon established as a primary commercial cleaning agent because of its powerful and versatile solvency, low toxicity, and virtual nonflammability.

Today, methylene chloride has a multitude of uses. It is a basic ingredient in paint strippers, carbon removers, brush cleaners, formulated industrial solvents, aerosol products, household specialties, rapid-drying paints, and adhesives. Other uses include secondary refrigeration, solvent extraction of food products and spices, a chemical reaction media, acetate film manufacturing, urethane foam blowing agent, and equipment cleaning solvent.

This booklet is designed to help users of methylene chloride in known applications as well as to aid in the creation of new applications. To this end, a review of the key characteristics, chemical and physical properties, uses, and safe handling of methylene chloride is offered.

KEY CHARACTERISTICS

Dow methylene chloride answers management *concerns*:

PRODUCTION

The powerful and versatile solvency of methylene chloride enables it to dissolve materials unaffected by other solvents. This property is valuable in products such as paint strippers.

SAFETY

Methylene chloride is one of the least toxic of the industrial solvents. Dow's Chemical Biology Research Department has investigated its toxicology and will consult with Dow customers.

COST

Dow methylene chloride can be recovered and reused repeatedly. Consequently, it is often able to compete with low-cost petroleum solvents.

MANUFACTURING FACILITIES

Dow methylene chloride is practically nonflammable. It has no flash or fire point by laboratory test methods, including the Tag Open Cup standard industrial method. Long industrial experience confirms these laboratory observations.

QUALITY

The purity and stabilization of Dow methylene chloride products are unsurpassed. Dow is the largest and leading manufacturer of methylene chloride.

ECOLOGY

Methylene chloride is among the saturated halogenated hydrocarbons described by the Environmental Protection Agency* under the Clean Air Act as "virtually unreactive in the formation of oxidants." Los Angeles Rule 66, San Francisco Rule 3, Philadelphia Regulation V, and others recognize the non-contributory role of methylene chloride in air pollution by exemption from control.

MORALE

Methylene chloride vapors can easily be controlled and are non-noxious under recommended working conditions. Products formulated from methylene chloride inherit no offensive odors.

* Federal Register, August 14, 1971, Vol. 36, No. 158

APPLICATIONS

PAINT STRIPPERS, CARBON REMOVERS, AND BRUSH CLEANERS

Methylene chloride is the active ingredient of essentially all of these products. The basic formulations developed by Dow which created these products have been constantly updated and are available through the local Dow sales offices listed on the back cover.

The strong solvent power of methylene chloride is amplified by a variety of activators, viscosity controlling agents, evaporation retardants, and surfactants. Diluents which lower the manufacturing cost without loss of performance, mixing procedures, corrosion and stability data, health hazards, physical properties, and applications are also described in the Dow formulations.

"Dow Suggested Scrape-Off Paint Remover Formulation D-316-20 (Modified)"

"Dow Suggested Industrial Paint Remover Formulation D-509-59"

"Dow Suggested Industrial Paint Remover Formulation D-509-82"

"Dow Suggested Carbon Remover Formulation D-705-29"

"Dow Suggested Immersion Paint Stripper Formulation D-730-67A"

"Dow Suggested Flush-Off Paint Remover Formulation D-876-15"

"Dow Suggested Industrial Paint Remover Formulation D-876-16"

INDUSTRIAL SPECIALTY CLEANING SOLVENTS

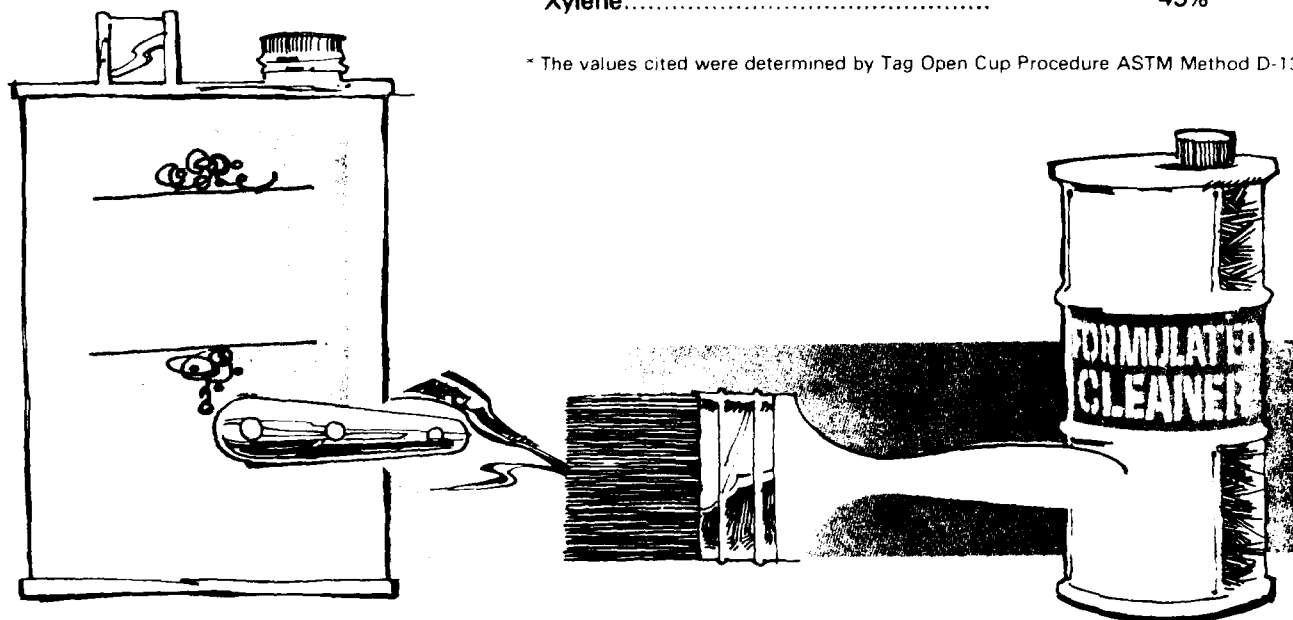
Methylene chloride has the extraordinary capacity to reduce the flammability of other

solvents. This quality is shown in Table I which shows minimum quantities of methylene chloride needed to formulate non-flashing mixtures with various flammable solvents.

Table I

FLAMMABLE SOLVENT	MINIMUM VOLUME METHYLENE CHLORIDE TO OBTAIN NONFLASHING MIXTURES*
Acetone	90%
n-Butyl alcohol	50%
Isobutyl alcohol	55%
n-Butyl acetate	50%
Isobutyl acetate	55%
Cyclohexane	75%
1,1-Dichloroethane	50%
1,2-Dichloroethylene	40%
Ethyl acetate	85%
Ethyl alcohol (2B abs.)	80%
Ethylene dichloride	40%
n-Heptane	75%
Iso-Heptane	70%
n-Hexane	90%
Methanol	95%
Methylcyclohexane	65%
Methyl ethyl ketone	70%
Naphthol spirits	40%
Octane	60%
n-Propyl alcohol	65%
Iso-Propyl alcohol	75%
Propylene dichloride	35%
Stoddard solvent	40%
Toluene	70%
Xylene	45%

* The values cited were determined by Tag Open Cup Procedure ASTM Method D-1310



Formulations of specific industrial cleaning solvents take advantage of this property and of the exceptional solvency of methylene chloride.

Because methylene chloride often evaporates more rapidly than its co-solvents, simple two-component mixtures usually become flammable after partial evaporation. To retard this process a third solvent, often perchloroethylene which evaporates more slowly, is frequently used. Such a composition is shown in Table II.

Table II

Stoddard Solvent.....	70.0% (vol.)
Methylene chloride.....	25.0%
Perchloroethylene.....	5.0%

Similar data on other tertiary systems are available from Dow. Contact the nearest office listed on the back cover.

AEROSOLS

Dow has developed a specially stabilized methylene chloride for this growing market. It is marketed under the trademark AEROTHENE[†] MM. Briefly, AEROTHENE MM replaces fluorocarbon Propellant 11, reducing manufacturing costs while maintaining product performance.

Literature on this product ("AEROTHENE Chlorinated Solvents, Higher Aerosol Profits with AEROTHENE Chlorinated Solvents") is available from local Dow offices.

PLASTICS

Urethane foam—Methylene chloride is used as a blowing agent for flexible foams. (The strong solvent characteristics of methylene chloride restricts its use in rigid foams.) Methylene chloride may be used to replace all or part of Fluorocarbon 11 blowing agent

resulting in cost savings. The gel time in both rigid and flexible foam in molding operations is often so brief that the mixing head must be rinsed between each mold pouring. Methylene chloride has become the standard solvent for this operation. Strong solvency is required to complete rinsing with a minimum of volume. Distillation recovery of this solvent is simplified by the low boiling point (104°F).

Polyester Fiber glass—This reinforced plastic used for such diverse items as yachts and street light posts employs methylene chloride as a clean-up solvent for tools and molds.

Cellulose Acetate—Methylene chloride is used in combination with other solvents in the manufacture of cellulose acetate film. The process is economical because of the high degree of recovery of this solvent. Other plastic films can be manufactured similarly.

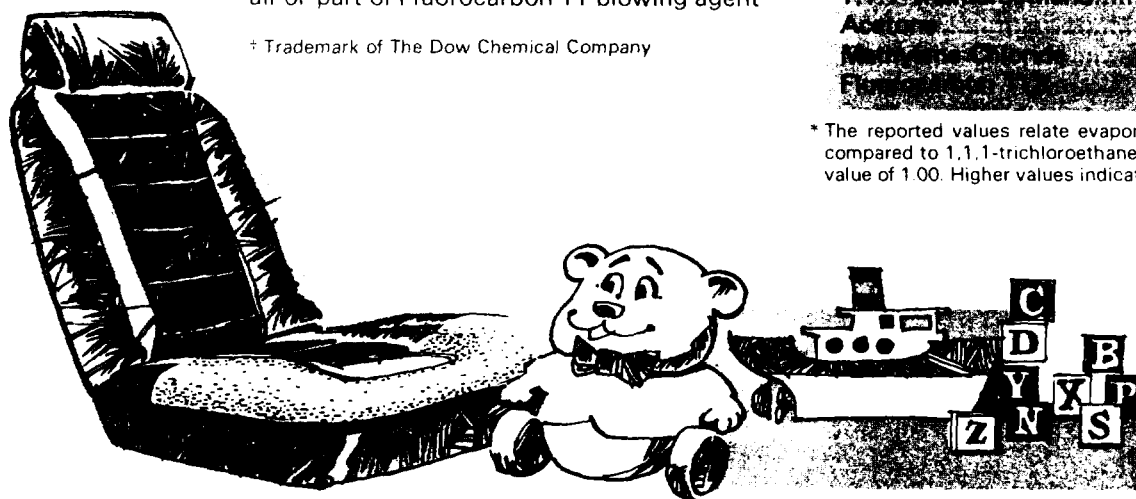
Mold Release Agent—The rapid application and drying of a silicone or other release agent is frequently necessary to prevent various plastics from permanently bonding to the molds. Methylene chloride is frequently used because its drying rate is very fast.

Table III

RELATIVE EVAPORATION RATES	
Water.....	0.25
Perchloroethylene.....	0.26
Heptane.....	0.42
Trichloroethylene.....	0.63
Methyl Alcohol.....	0.65
1,1,1-Trichloroethane.....	1.00
Acetone.....	1.40
Methylene Chloride.....	3.50
Fluorocarbon 11.....	3.85

* The reported values relate evaporation of the solvent compared to 1,1,1-trichloroethane which is assigned a value of 1.00. Higher values indicate faster evaporation.

[†] Trademark of The Dow Chemical Company



ADHESIVES

The ability of methylene chloride to dissolve a wide variety of thermoplastic materials, fast drying time, and low toxicity have established it as a prime solvent in adhesives. Rubber cements as well as adhesives based on styrene, methyl methacrylate, epoxy resins and others can be prepared with methylene chloride.

PAINTS

While methylene chloride can be used as a minor constituent in paints for solubility alone, some systems use it as the main carrier to obtain rapid drying. Rapid-dry highway paints are becoming more prominent in major cities and other high traffic areas. Alternate rapid-drying solvents are either highly flammable or exorbitantly expensive. Aerosol paint formulations are common users of AEROTHENE MM methylene chloride as a vapor pressure depressant due to its inhibition against aluminum paint reactions.

PAINT MASK CLEANING

Decorative industrial painting is done with a metal mask which protects surfaces which should not receive paint. After several sprayings, these masks are cleaned by soaking or spraying with methylene chloride to restore their sharp lines. The methylene chloride is distilled and reused numerous times in this use.

VAPOR DEGREASING

This process of cleaning by condensing solvent vapors is described in the Dow booklet, "Modern Vapor Degreasing." Methylene chloride is used in this process and is particularly suited to degreasing temperature-sensitive parts, e.g. thermal switches or thermometers. These and other items could be damaged by temperatures higher than 104°F, the solvent boiling point. Similarly, parts, which must be air-gauged or manually handled immediately after degreasing, can benefit from methylene chloride's low boiling temperature.

PHOTOGRAPHIC RESIST STRIPPING

Riston* and KPR** photographic resist products are widely used to manufacture printed circuit boards and/or thin parts by chemical milling. Final removal of the ultra-violet light cured film requires the solvent strength of methylene chloride or activated formulations based on methylene chloride. Local Dow Sales Offices can provide the latest information on solvent developing and stripping of the light-sensitive films.

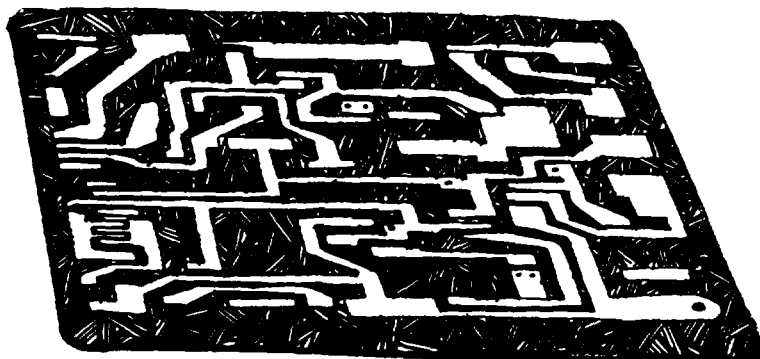
SECONDARY REFRIGERATION

The extremely low freezing point of methylene chloride of -97°C (-142.6°F) is its first qualification for this use. However, low cost, virtual nonflammability, low corrosivity, and light viscosity also contribute to its selection. Viscosity curves of methylene chloride and other secondary refrigeration media are compared on the graph below.

These characteristics are also valuable in low-temperature baths for calibration, cloud point testing, etc. In fact, a methylene chloride-dry ice bath is less flammable than the common acetone-dry ice system.

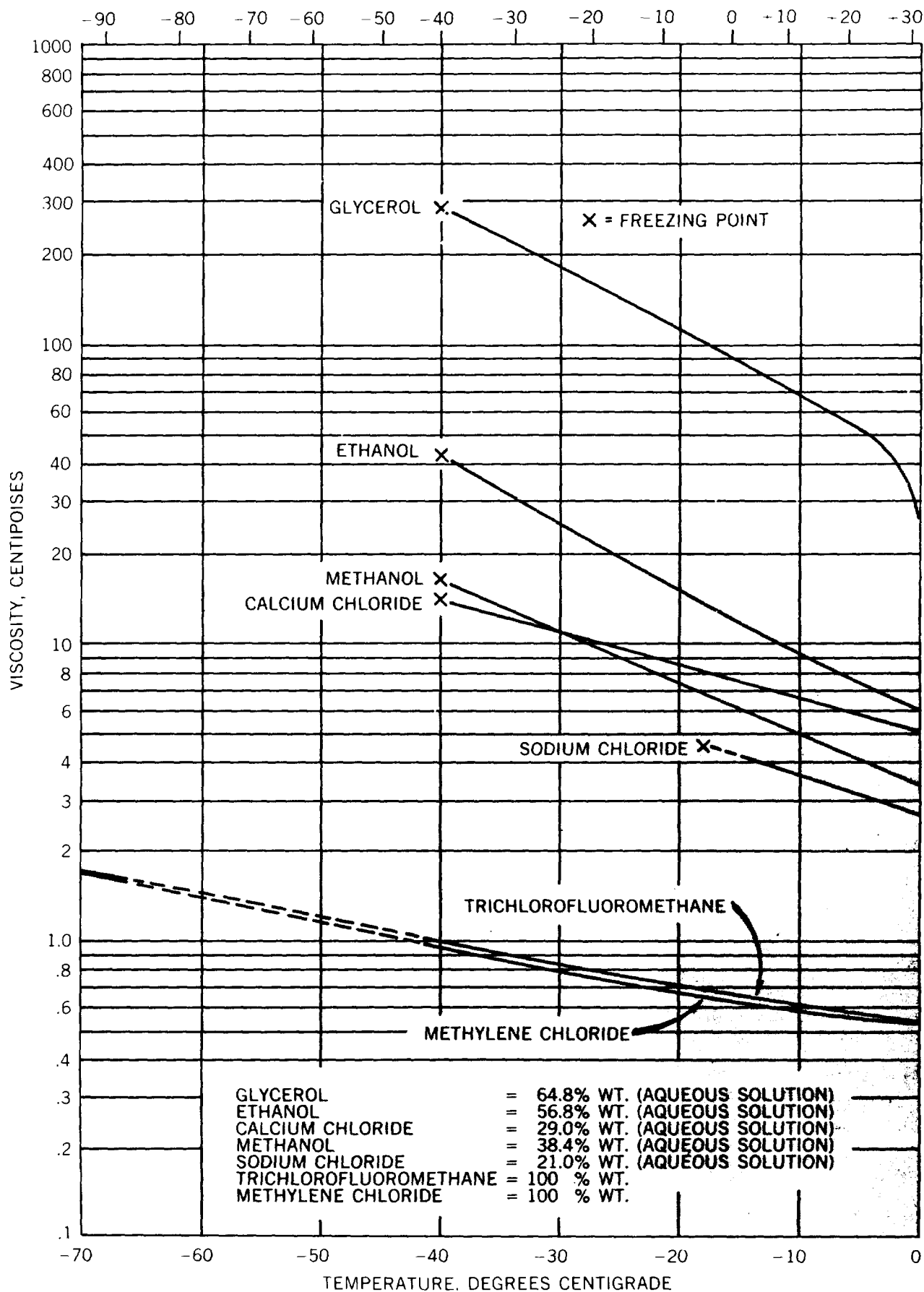
* Trademark of E. I. duPont de Nemours & Co

** Trademark of Eastman Kodak Co



Viscosity Curves for Common Secondary Refrigerants

Temperature, Degrees F



SOLVENT EXTRACTION

Methylene chloride is employed as an extractant in the recovery and purification of a wide variety of materials including oils, fats, waxes, perfumes, flavors, and drugs. The utility of methylene chloride for this use stems from its high solvent power, low boiling point, and low heat content. Many products recovered by solvent extraction cannot tolerate high temperatures. The low boiling point of methylene chloride eliminates or lessens heat damage to the product being recovered. The low heat of vaporization provides greater economies during extraction and recovery operations. Specifically, methylene chloride is currently used for the decaffeination of coffee, oleoresin extraction from a variety of spices, and for the extraction of hops. FDA tolerances have been established for these particular uses. See Part 121 Title 21 code of Federal Regulations paragraph 121.1039.

TABLET COATING

Methylene chloride mixed with a moderate proportion of an alcohol, such as ethanol, is becoming accepted as the best carrier for pharmaceutical tablet coatings. METHOCEL® cellulose ether is deposited successfully from such a system and provides a superior tablet coating in a fraction of the time required by conventional techniques.

SHRINK FITTING

Methylene chloride will swell most natural and synthetic elastomeric materials. This property, usually regarded as detrimental, is utilized for shrink-fitting rubber grips onto bicycle handlebars, pliers, golf clubs, lawn mowers, and similar equipment. The grip is first swollen with solvent, then slipped into place. As the solvent evaporates, the grip shrinks to give a tight fit. The most secure fit is obtained by undersizing the inside of the grip and swelling it just sufficiently to slip readily into place.

CHEMICAL REACTION MEDIA

The inherent stability and ease of separation and recovery make methylene chloride valuable as a chemical reaction media. For example, it is a favored co-solvent with tertiary amines in manufacturing polycarbonate plastic from bisphenol A and phosgene. It is also used for the sulfonation of polyethylene or polypropylene plastic surfaces to enhance their bonding characteristics to paints or dyes.

PHYSICAL PROPERTIES

Molecular weight	84.94
Boiling point.....	103.6°F (39.8°C)
Freezing point.....	-142.1°F (-96.7°C)
Pounds per gallon at 25°C	10.98
Specific heat (cal/g/°C)	0.240
Refractive index at 25°C	1.421
Viscosity at 25°C in centistokes.....	0.329
Heat of vaporization (at boiling point)	
cal/gm	78.7
Btu's/lb	141.7
Flash point	none
Fire point.....	none
Initial thermal degradation temperature.....	250°F (120°C)
Autoignition temperature.....	1185°F (640°C)
Critical density.....	0.472 g/cc
Critical temperature.....	245°C
Critical pressure.....	60.9 atm
Coefficient of cubical expansion, 20 to 30°C	0.0014/°C
Explosive Limits:	
% volume in oxygen	15.5-66.9
% volume in air, 10 kilowatt spark.....	none at 25°C; 12-19 at 30°C*
Threshold limit value	500
Kauri Butanol value.....	136
Dielectric constant at 24°C, 10 ⁵ cycles.....	10.7
Dielectric strength, volts/100 mils	24,000
Specific resistivity at 24°C.....	1.81 x 10 ⁸ ohm-cm
Surface tension (dynes/cm):	
20°C.....	28.12
30°C.....	26.54
Solvent - Water azeotrope:	
Boiling point.....	101°F (38.3°C)
% Water by weight	1.5
Vapor density (air = 1.00).....	2.93
Diffusivity in air	0.09 sq cm/sec

*Dow Reactive Chemical Material Report No. RCM-192.

NOTE: These properties are laboratory results typical of the product, but should not be confused with, or regarded as, specifications.

Table IV—Solubility Characteristics of Methylene Chloride-water Systems

TEMPERATURE		SOLUBILITY, GMS./100 GMS.	
°C.	°F.	WATER IN SOLVENT	SOLVENT IN WATER
-70	-94	0.006	—
-60	-76	0.008	—
-50	-58	0.012	—
-40	-40	0.019	—
-30	-22	0.028	—
-20	- 4	0.040	—
-10	+14	0.056	—
0	+32	0.078	1.98
+10	+50	0.108	1.58
+20	+68	0.145	1.38
+30	+86	0.198	1.27
+40	+104	0.261	1.20

Table V—Thermodynamic Properties of Methylene Chloride

TEMP. °C.	HEAT CAPACITY (CAL./G. MOLE)	ENTHALPY (CAL./G. MOLE)	ENTROPY (CAL./G. MOLE)
25	12.93	0	64.68
27	12.95	26	64.76
77	13.88	691	68.81
127	14.77	1407	70.53
177	15.61	2167	72.35
227	16.38	2967	73.67
277	17.05	3803	75.18
327	17.70	4672	76.62
377	18.26	5571	77.93
427	18.77	6497	79.25
477	19.21	7447	80.57
527	19.62	8418	81.89
577	20.00	9408	83.21
627	20.35	10417	84.53
677	20.65	11442	85.85
700	20.78	12150	86.57
800	21.34	14260	88.57
900	21.83	16420	90.57
1000	22.25	18620	92.57
1100	22.62	20860	94.57
1200	22.93	23140	96.57

Solubilities of Resins, Waxes, and Fats in Methylene Chloride*

MATERIAL OR BRAND	SOLUBILITY
ABALYN—Resin esterified with glycerine	>100
ACRAWAX C—Synthetic wax	<1
ACRYLOID B-82—Acrylic ester	>100
ALINCA Z2—Linseed oil	>100
AMBEROL 801-XLT—Phenolic	>100
AMBEROL ST-137-X—Phenol-formaldehyde	>100
BAKELITE CKR-5254—Phenolic	<20
BECKACITE 1001—Phenolic	>100
BECKACITE 1112—Phenolic	>100
Bees Wax	<5
Calcium Stearate	<1
Candelilla Wax	<1
Carnuba Wax	<1
Ceresin Wax	<1
CUMAR W-1—Paracumarone-indene	>100
D. C. R. -5061—Silicone	>100
D. C. R. -5581—Silicone	>100
D. E. N. 438—Epoxy novolac	>100
D. E. R. 331—Epoxy	>100
D. E. R. 332—Epoxy	>100
D. E. R. 334—Epoxy	>100
D. E. R. 661—Epoxy	>100
D. E. R. 664—Epoxy	>100
D. E. R. 667—Epoxy	>100
DOW Resin PS-3—Polystyrene	>100
EPON 812—Epoxy	>100
EPON 836—Epoxy	>100
EPON 1004—Epoxy	>100
EPON 1109—Epoxy	>100
GENEPOXY 175—Epoxy	>100
GENEPOXY M-180—Epoxy	>100
GENEPOXY 190—Epoxy	>100
GENEPOXY 525—Epoxy	>100
GENEPOXY 925—Epoxy	>100
GENEPOXY 1800—Epoxy	>100
HERCOLYN—Resin esterified with glycerine	>100
Japan Wax	<1
Lanolin Anhydrous	>100
Methyl Methacrylate	>100
Montan Wax	<1
NEVINDENE RS—Cumarin indene	>100
OKO S-70—Soy bean oil	>100
Orange Shellac	<1
Paraffin 47-49°C	<15
Paraffin 54-56°C	<5
PARLON S-5—Chlorinated rubber	>100
PARLON S-20—Chlorinated rubber	>100
PARLON S-300—Chlorinated rubber	>60 [†]
PECCO 420 ES—Indene polymer	>100
PICCOLASTIC A-75—Polystyrene	>100
PICCOLYTE S-85—Polyterpene	>100
PICCOPALE 100—Hydrocarbon	>100
Potassium Oleate	<1
Polyvinyl Chloride	<1
Resin 276-V9—Polyalkyl styrene	>100
Rosin (wood)	>100
Sarant ^{††} F-120—Vinylidene chloride-acrylonitrile	<1
Saran F-220—Vinylidene chloride-acrylonitrile	<1
Sodium Oleate	<1
Stearic Acid	<35
VELSICOL AE9—ETO adducts	<10
VERSAMIDE 940—Polyamide	>100
VINYLITE AYAA—Vinyl acetate	>100
VINYLITE VYHH—Vinyl chloride acetate	>50 [†]
White petrolatum	<20

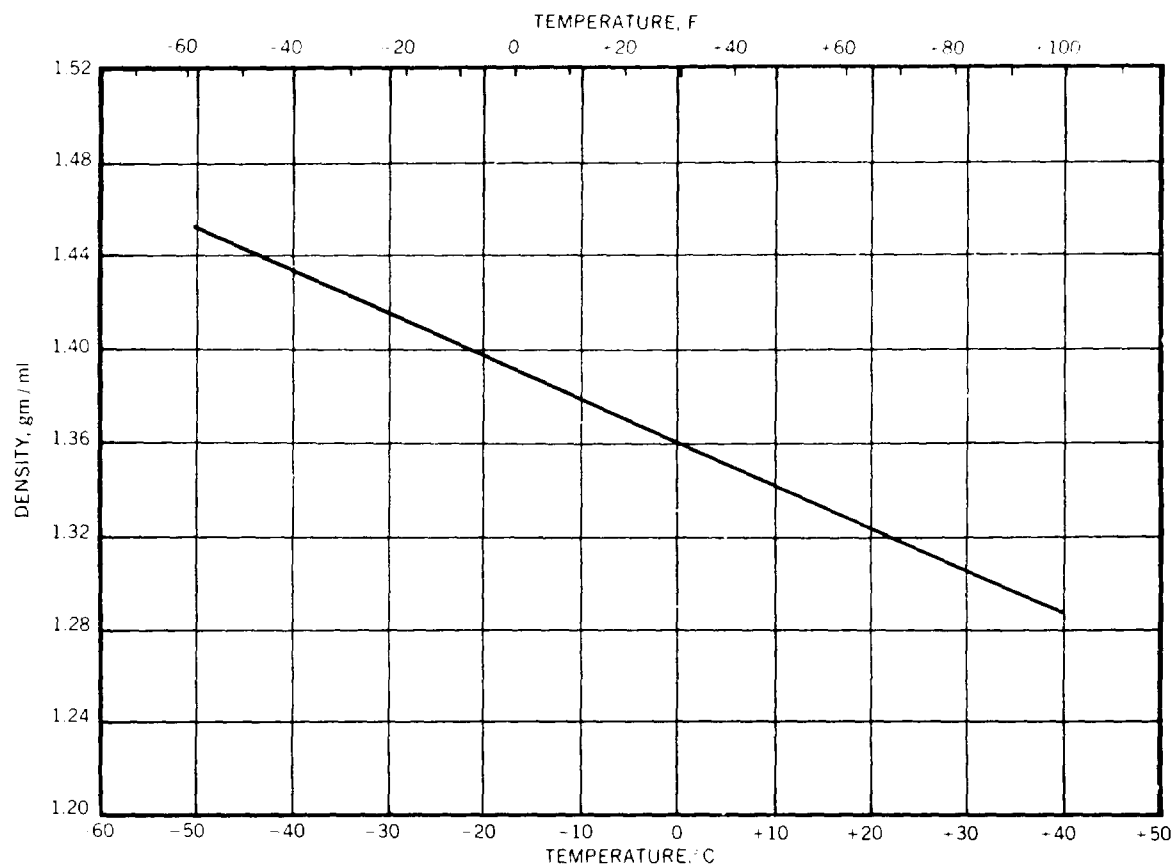
[†] Too viscous for further addition.

* Solubilities were determined by the incremental addition of solute to 100 grams of methylene chloride at room temperature. Solute was added in the following increments: 1 gram, 5 grams, 10 grams and so on in 5-gram steps up to a maximum of 100 grams. Thus a notation of <5 indicates that more than 1 gram but less than 5 grams of solute can be dissolved in 100 grams of methylene chloride. Similarly, a notation of <40 indicates that more than 35 but less than 40 grams of solute will dissolve. Where 100 grams of solute dissolve, the result is reported as >100. Resin solubilities were obtained on *uncured* material suitable for use in paints, adhesives, and coatings.

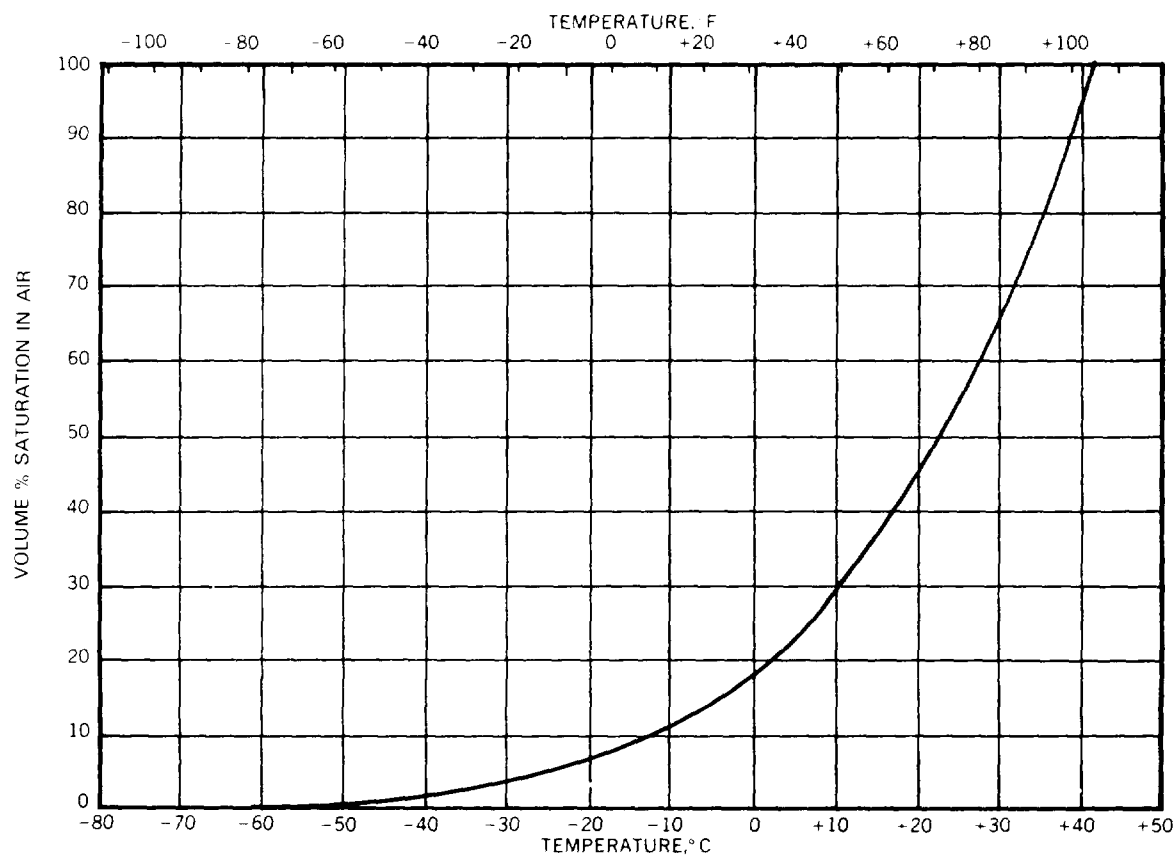
[†] Trademark of The Dow Chemical Company.

^{††} Trademark of The Dow Chemical Company abroad.

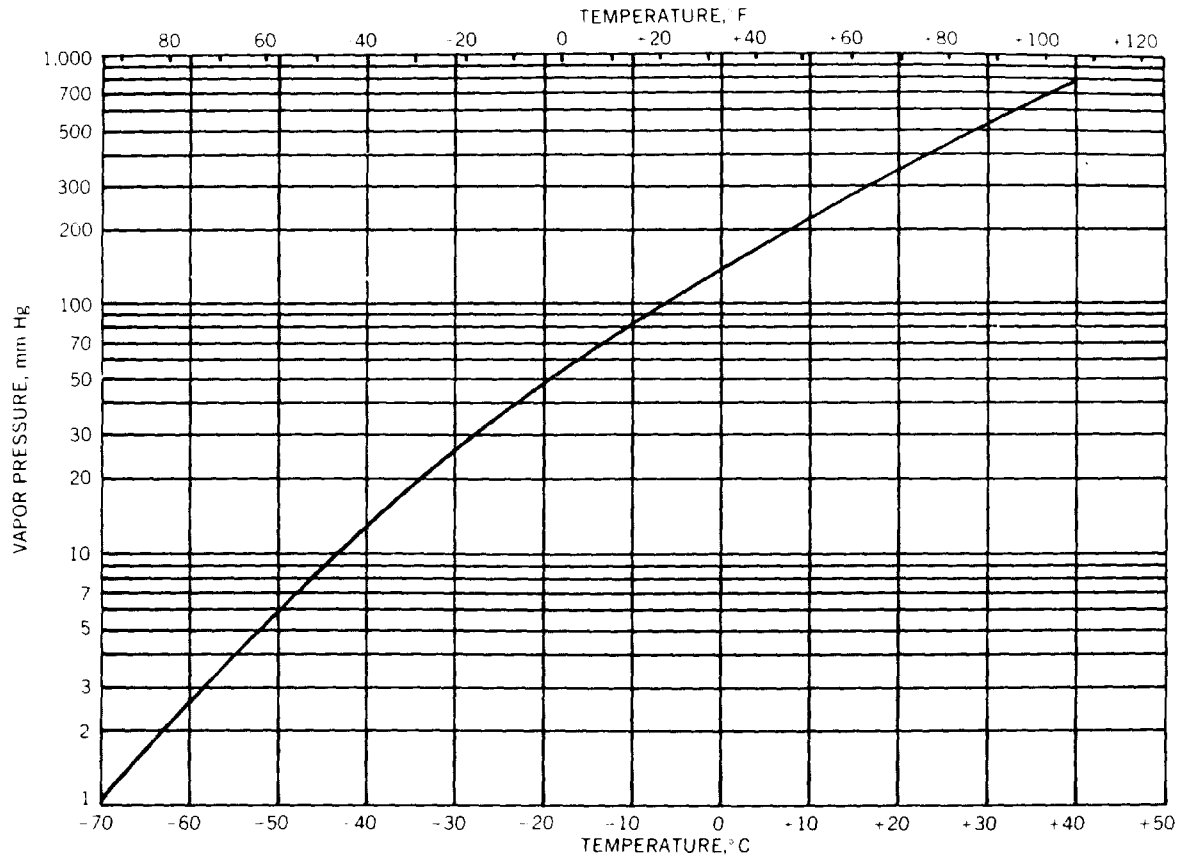
Density vs Temperature for Methylene Chloride



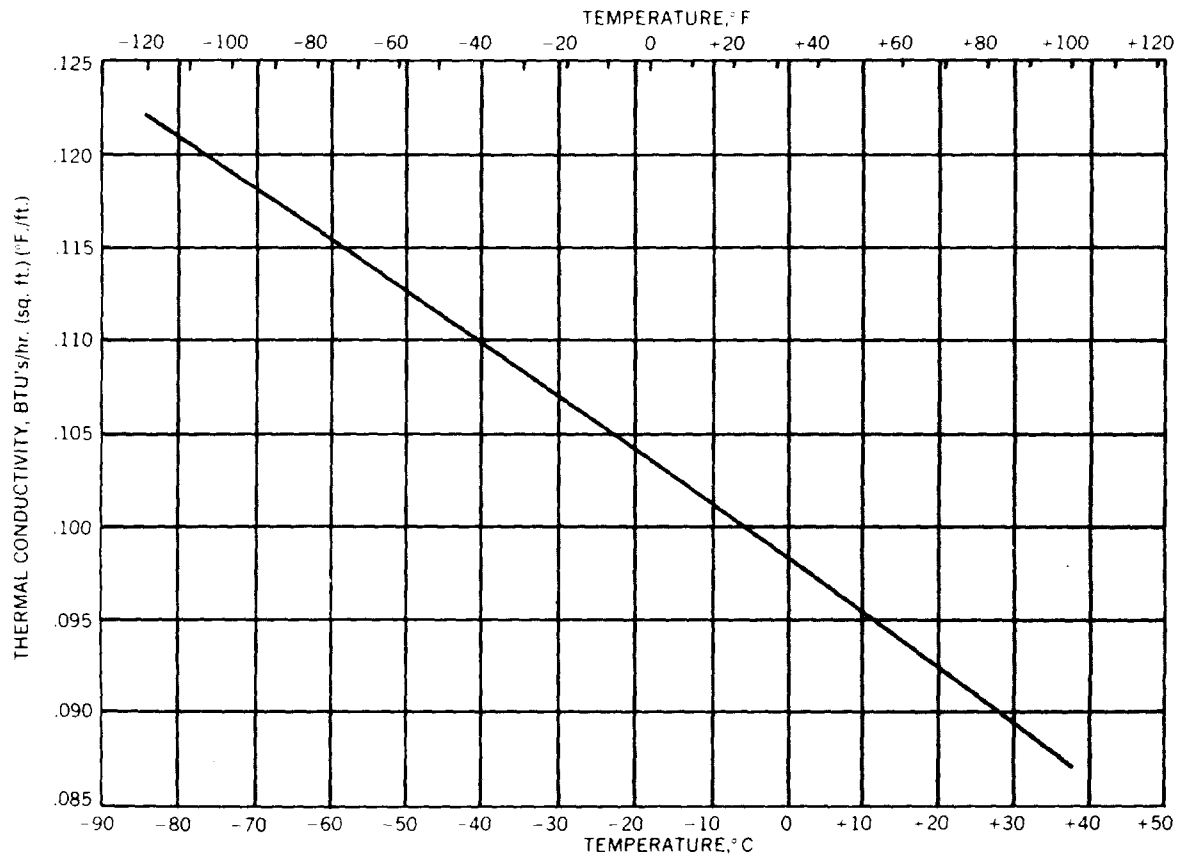
Dew Point of Methylene Chloride



Vapor Pressure vs Temperature for Methylene Chloride



Thermal Conductivity vs Temperature for Methylene Chloride



SPECIFICATIONS

Complete analytical methods for the test items within the specification are available through your local Dow Sales Office or through The Dow Chemical Company, Inorganic Chemicals Department, 2020 Dow Center, Midland, Michigan 48640.

Distillation range at 760 mm Hg, IBP-DP	39.4-40.4°C
Specific gravity at 25/25°C	1.319-1.322
Acidity (as HCl), maximum	5 ppm
Nonvolatile matter, maximum	10 ppm
Water, maximum	100 ppm
APHA color, maximum	10
Free halogens	negative to test
Residual odor	negative to test
Meets U. S. Military Spec. MIL-D-6998B (Grades A & B)	

HEALTH CHARACTERISTICS

Many of the applications of methylene chloride depend on its characteristic low degree of hazard at least in part.

FLAMMABILITY

Methylene chloride has neither a flash nor fire point as reported by any of the standard test methods: Tag open cup, Tag closed cup, Cleveland open cup. It is rated as "non-flammable" by the American Mutual Insurance Alliance and "practically nonflammable" by the National Fire Protection Association. However, both agencies report flammable limits in pure oxygen between 15.5% and 66% by volume of MeCl_2 , and Dow laboratory data indicate flammable limits on air of 12%-19% at 30°C, both of which are impractical under normal circumstances.

Methylene chloride vapors can be decomposed by contacting hot surfaces, direct combustion in a flame or high intensity ultra-violet light. Its autoignition temperature is 640°C. The products of decomposition are hydrochloric acid, carbon dioxide, carbon monoxide, and lesser quantities of phosgene. The irritating nature of hydrochloric acid will normally provide adequate warning.

TOXICITY

Methylene chloride is frequently used specifically because of its low degree of toxicity.

The vapors of methylene chloride, if breathed, are *not likely to cause organic injury*. However, single exposures of more than a few minutes to high concentrations of vapor may cause anesthetic effects. Minimal effects, such as irritation of eyes and nose, possibly nausea and drunkenness, may occur after prolonged exposure to concentrations ranging from 1,000 to 10,000 ppm. Because of the high volatility of methylene chloride even at room temperature, vapor concentrations can reach levels high enough to result in a health hazard from inhalation in inadequately ventilated areas.

The Threshold Limit Value for methylene chloride has been accepted as being 500 ppm. This is the level that satisfies the regulations under the Occupational Health and Safety Act of 1970. It is also that recommended by the American National Standard of acceptable concentrations of methylene chloride (see ANSI Z 37.23-1969).

A Threshold Limit Value is a suggested guide for the control of health hazards and is defined as a time weighted average concentration to which nearly all workers may be repeatedly exposed, day after day, without adverse effect. (For further discussion see the reference cited below.)

For the convenience of the reader, the T.L.V.'s for a number of common solvents are given in Table VI.

Table VI—
Threshold Limit Values¹

SOLVENT	THRESHOLD LIMIT VALUES
Acetone.....	1000 ppm
Ethyl alcohol.....	1000 ppm
Methylene chloride.....	500 ppm
Ethyl acetate.....	400 ppm
Ethyl ether.....	400 ppm
Isopropyl alcohol.....	400 ppm
Octane	400 ppm
Cyclohexane	300 ppm
Methyl alcohol	200 ppm
Methyl ethyl ketone.....	200 ppm
Stoddard solvent.....	200 ppm
Toluene	200 ppm
Naphtha (coal tar)	100 ppm
Perchloroethylene	100 ppm
Trichloroethylene	100 ppm
Turpentine	100 ppm
Xylene.....	100 ppm
Chloroform	50 ppm
Benzene (ceiling ²) (skin ³)	25 ppm
Carbon tetrachloride (skin ³)	10 ppm

¹ Taken from the lists of Threshold Limit values of Airborne Contaminants for 1970 as adopted by the American Conference of Governmental Industrial Hygienists.

² Ceiling which should not be exceeded if adverse effects are to be avoided.

³ Skin—this designation indicates that absorption through the intact skin may be significant and that protective measures should be taken.

The pamphlet "Threshold Limit Values of Airborne Contaminants" for 1970, is recommended reading for complete description of the limitations and proper use of TLV's. It is available from the Secretary-Treasurer, American Conference of Governmental Industrial Hygienists, 1014 Broadway, Cincinnati, Ohio 45202, at 50¢ per copy.

It is difficult to predict the toxicological properties of formulations based upon a knowledge of the toxicological properties of the ingredients. Therefore, formulations containing methylene chloride should be evaluated toxicologically to provide a basis for judging the health hazards in their handling and use.

Prolonged or repeated contacts with the skin may produce irritation. Such contacts may also result in defatting of the skin. Occasional brief contact is not likely to have adverse effects. Skin absorption is not a problem under anticipated conditions of industrial operations. Thus liquid methylene chloride presents a minor hazard from skin contact.

Eye contact may cause pain and transient irritation but is unlikely to cause eye injury. Hence, the solvent presents a low degree of hazard from eye contact.

When methylene chloride is confined to the skin or eyes, it is capable of causing marked pain and possible serious injury. Formulations of methylene chloride containing thickeners or film formers whose purpose is to hold the formulation to the surface are likely to present a marked hazard from skin and eye contact and should be handled so as to prevent such contact.

Methylene chloride has a low acute oral toxicity. Ingestion of toxic amounts is not likely to occur incidental to industrial handling.

Handling, First Aid



ADDITIONAL TOXICITY LITERATURE AVAILABLE

The following reprints on the toxicity of, and safe handling procedures for, Chloro-thene NU solvent are available from The Dow Chemical Company, Chemical Biology Research, 1701 Building, Midland, Michigan 48640.

1. Dichloromethane—Hygienic Guide Series, American Industrial Hygiene Association.
2. "Summary of Toxicological Information on Methylene Chloride," Biochemical Research Laboratory, The Dow Chemical Company.

3. "Properties, Health Hazards and Precautions for Safe Handling," Methylene Chloride, Biochemical Research Laboratory, The Dow Chemical Company.
4. "Chemical Safety Data Sheet SD-86 — Methylene Chloride," Manufacturing Chemists Association.
5. "Toxicology of Dichloromethane (Methylene Chloride)," U.S. Public Health Service.
6. "Absorption of Carbon Tetrachloride, Trichloroethylene, Tetrachloroethylene, Methylene Chloride, and 1,1,1-Trichloroethane Through the Human Skin," Medical Research Laboratory, The Dow Chemical Company.
7. "Methylene Chloride Vapor in Expired Air of Human Subjects," Laboratory of Industrial Medicine, Eastman Kodak Company.

Suggested Precautions for Safe Handling

Methylene chloride is one of the least toxic of the commonly available chlorinated hydrocarbon solvents. Nevertheless, care must be exercised to avoid repeated or prolonged exposures to high concentrations which may be encountered even at room temperature in the absence of appropriate ventilation. Where such high concentrations are encountered, either a gas mask equipped with a canister approved for organic vapors or a self-contained breathing apparatus may be required, depending upon the degree of exposure. Levels of methylene chloride vapors below 500 ppm in the work room air are considered acceptable.

The practice of reasonable care and personal cleanliness should be observed to avoid skin contact and ingestion. Safety glasses, or their equivalent, should be worn simply to avoid the pain and irritation that may occur from exposure of the eye to the liquid.

ENTRY INTO TANKS, PITS OR OTHER CONFINED SPACES

Experience has shown that exposure in confined spaces presents a serious problem with all volatile solvents and needless fatalities have occurred from failure to observe standard entry procedures. Several organizations have recommended precautions for entry into tanks, pits, equipment, small rooms or other confined spaces. Copies of a recommended set of precautions must be available to workers using chlorinated solvents and other volatile solvents and educational programs provided to assure understanding of and compliance with the necessary safety measures.

All of these published recommendations require consideration of the following:

1. Blanking off of all lines to isolate the space.
2. Positive ventilation of the space.
3. Analysis of the atmosphere in the space.
4. Proper respiratory protective equipment.
5. A lifeline and harness on the worker entering the confined space.
6. A similarly equipped stand-by man stationed outside the confined space who is in a position where he can observe the worker at all times.
7. Training in artificial respiration techniques.

Local state and federal labor laws may apply to vessel entry.

STORAGE AND HANDLING

Complete storage and handling information for Dow methylene chloride and other chlorinated solvents is included in the bulletin "Bulk Chlorinated Solvents — Storage, Delivery, Handling," available upon request.

ECOLOGY

Methylene chloride has been found to be "virtually unreactive" under atmospheric conditions whereas "Smog" producing solvents react generating oxidants.

The Environmental Protection Agency* has suggested the control of all organic chemical emissions greater than three pounds per hour or 15 pounds per day. Methylene chloride and other saturated halogenated hydrocarbons, perchloroethylene, benzene, acetone, and lower hydrocarbons (C₁-C₅) may be considered for exemption. The EPA further states that, "Use of exempt solvents as substitutes for regulated solvents may be considered 100 percent effective in reducing reactive organic solvent emissions."

The reduction of all organic emissions is the first objective of air pollution codes. However, methylene chloride should be considered whenever existing technology cannot provide adequate recovery efficiencies or when emission control is economically prohibitive with regulated solvents.

* Federal Register Vol. 36, No. 158
August 14, 1971 — par. 4.6 and 4.7

Dow Methylene Chloride... the versatile solvent to help you create better products

AREA HEADQUARTERS

DOW CHEMICAL U.S.A.	MIDLAND, Michigan
DOW CHEMICAL LATIN AMERICA	CORAL GABLES, Florida
DOW CHEMICAL EUROPE, S.A.	ZURICH, Switzerland
DOW CHEMICAL PACIFIC	HONG KONG, B.C.C.
DOW CHEMICAL OF CANADA, LIMITED	SARNIA, Ontario

DOW CHEMICAL U.S.A. SALES OFFICES

ATLANTA	1515 Lenox Towers, 3400 Peachtree Rd., N.E., Atlanta, Ga.	30326
BATON ROUGE	2526 Sherwood Forest Blvd., Baton Rouge, La.	70816
BOSTON	1330 Boylston St., Chestnut Hill, Mass.	02167
BUFFALO	560 Delaware Ave., Buffalo, N.Y.	14202
CHARLOTTE	200 South Tryon St., Charlotte, N.C.	28202
CHICAGO	1400 East Touhy Ave., Des Plaines, Ill.	60018
CINCINNATI	Colonial Center Bldg., 5725 Dragon Way, Cincinnati, O.	45227
CLEVELAND	55 Public Square, Cleveland, O.	44113
CONNECTICUT	Washington Plaza, 1351 Washington Blvd., Stamford, Conn.	06902
DALLAS	1401 Elm Street, Dallas, Texas	75202
DETROIT	600 Northland Towers West, 15565 Northland Dr., Southfield, Mich.	48075
GRAND RAPIDS	Camelot East Bldg., 3445 Lake Eastbrook Blvd., Grand Rapids, Mich.	49508
HOUSTON	P.O. Box 3387, Attn: Sales Office, Houston, Texas	77001
INDIANAPOLIS	P.O. Box 88350, Indianapolis, Ind.	46208
KANSAS CITY	P.O. Box 13646, Kansas City, Mo.	64199
LOS ANGELES	P.O. Bin 48, Pasadena, California	91109
MEMPHIS	1220 Clark Tower, 5100 Poplar Avenue, Memphis, Tenn.	38137
MINNEAPOLIS	4901 West 77th St., Minneapolis, Minn.	55435
NEW YORK	45 Rockefeller Plaza, New York, N.Y.	10020
NORTHERN NEW JERSEY	Park 80 Plaza East, Saddle Brook, N.J.	07662
PHILADELPHIA	P.O. Box 350, Moorestown, N.J.	08057
PITTSBURGH	Four Gateway Center, Suite 1313, Pittsburgh, Pa.	15222
ST. LOUIS	800 Pierre Laclede Center, 7733 Forsyth Blvd., St. Louis, Mo.	63105
SAN FRANCISCO	350 Sansome St., San Francisco, Cal.	94106
SEATTLE	777-106th St., N.E., Bellevue, Wash.	98004

NOTICE—The information and recommendations herein are, to the best of Seller's knowledge, accurate and reliable and Seller's products mentioned are reasonably fit for the purposes so recommended. However, as use conditions are not within its control, Seller does not guarantee results from use of such products or other information herein. Freedom from patents of Dow or others is not to be inferred.

DOW CHEMICAL U.S.A.
AN OPERATING UNIT OF THE DOW CHEMICAL COMPANY
INORGANIC CHEMICALS DEPARTMENT
MIDLAND, MICHIGAN 48640



* Trademark of The Dow Chemical Company

U.S. DEPARTMENT OF LABOR

WAGE AND LABOR STANDARDS ADMINISTRATION
Bureau of Labor Standards

MATERIAL SAFETY DATA SHEET

SECTION I

SHAMPOCK CHEMICAL COMPANY (Name, Number, Street, City, State, and ZIP Code)		EMERGENCY TELEPHONE NO. 216-352-9311 Ex. 207 Tech. Center
12000 Commerce Building Cleveland, Ohio 44114		TRADE NAME AND SYNONYMS "Trichlor"
1,1,1-Trichloroethylene (ethylene trichloride)		FORMULA CHCl:CCl ₂
Saturated hydrocarbon		

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III PHYSICAL DATA

Boiling Point, °F	188	SPECIFIC GRAVITY (H ₂ O = 1) @ 25/25°C	1.456
Vapor Pressure (mm Hg.) @ 20°C	58.6	PERCENT VOLATILE BY VOLUME (%)	100
Vapor Density (AIR = 1)	4.54	EVAPORATION RATE (Ether = 100)	28
Solubility in Water @ 25°C gm/100gms	0.11		
APPEARANCE AND ODOR	Clear, water-white liquid with a mild sweetish odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	None (C.C.C.)	FLAMMABLE LIMITS	UEL	UEL
EXTINGUISHING MEDIA	Self extinguishing			
SPECIAL FIRE FIGHTING PROCEDURES	None			
PHYSICAL FIRE AND EXPLOSION HAZARDS	Extremely high temperatures, i.e., open flames or electrical arcs.			

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	TLV = 100 ppm by vol. in air (MAC = 200)
EFFECTS OF OVEREXPOSURE	Irritation to the nose and throat. Causes mental dullness, dizziness, drowsiness, stupor, headache, nausea, unconsciousness and even death.
EMERGENCY AND FIRST AID PROCEDURES	Remove promptly from contaminated area. If breathing has stopped apply artificial respiration. A physician should be called at once.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID	Excessive heat, moisture, and air.
	STABLE	X		
INCOMPATIBILITY (Materials to avoid)	None			
HAZARDOUS DECOMPOSITION PRODUCTS	Hydrogen chloride and phosgene			
HAZARDOUS POLYMERIZATION	MAY OCCUR	X	CONDITIONS TO AVOID	Highly alkaline materials,
	WILL NOT OCCUR			ie., sodium hydroxide and potassium hydroxide.
Aluminum.				

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	Wipe up all spills with absorbent cloth or allow to evaporate with plenty of ventilation.
WASTE DISPOSAL METHOD	Evaporation

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)		
Self-contained: Positive pressure hose mask; air-line mask; canister type gas mask.		
VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL (General)	OTHER
PROTECTIVE GLOVES		EYE PROTECTION
Polyvinyl alcohol plastic		Chemical safety goggles.
OTHER PROTECTIVE EQUIPMENT		

SECTION IX SPECIAL PRECAUTIONS

STEPS TO BE TAKEN IN HANDLING AND STORING	Avoid high temperatures, ie., open flames, and electrical arcs. Store in a cool well ventilated area.
PRECAUTIONS	

U.S. DEPARTMENT OF LABOR
WORKPLACE STANDARDS ADMINISTRATION
Bureau of Labor Standards

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MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME Source of Data: DETREX CHEMICAL IND., INC.		EMERGENCY TELEPHONE NO. Area 313 868-8600
ADDRESS (Number, Street, City, State, and ZIP Code) Box 501 Detroit, Michigan 48232		
CHEMICAL NAME AND SYNONYMS (Trichloroethylene)		TRADE NAME AND SYNONYMS PERM A CLOR NA
CHEMICAL FAMILY Chlorinated Hydrocarbon	FORMULA CCl₂ = CHCl	

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS	100	100	FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	188	SPECIFIC GRAVITY (H ₂ O=1)	1.46
VAPOR PRESSURE (mm Hg.)	58	PERCENT VOLATILE BY VOLUME (%)	100
VAPOR DENSITY (AIR=1)	4.54	EVAPORATION RATE (ether=1)	0.28
SOLUBILITY IN WATER (less than 0.1%)	Negligible		
APPEARANCE AND ODOR Clear, colorless liquid with characteristic mild ethereal odor.			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) None (Closed Cup Method)	FLAMMABLE LIMITS n.a.	LeI	UeI
EXTINGUISHING MEDIA			
SPECIAL FIRE FIGHTING PROCEDURES (Note: In chlorinated solvent degreasers that clean aluminum production, use only water to reduce the aluminum reaction, if and when that occurs.)			
UNUSUAL FIRE AND EXPLOSION HAZARDS Vapors can be decomposed by intense heat or open flames releasing HCl			

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE 100 ppm (520 mg/m³)

EFFECTS OF OVEREXPOSURE Overexposure may lead to slight anesthetic feeling, possible irritation to eyes, nose and throat. Continued exposure can result in headaches, fatigue, dizziness, nausea and gradual suppression of consciousness.

EMERGENCY AND FIRST AID PROCEDURES Move patient to fresh air and if unconscious give artificial respiration or oxygen. Any clothing that has been wet with the solvent liquid should be removed, the skin allowed to air dry completely and then treated with a lanolin cream. If liquid has entered the eyes it should be immediately flushed with lukewarm water for at least 15 minutes.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID Welding, open flames and infra red heaters.
	STABLE	X	

INCOMPATIBILITY (Materials to avoid) Sodium and Potassium hydroxides and cyanides

HAZARDOUS DECOMPOSITION PRODUCTS HCl during thermal decomposition

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Avoid breathing high concentrations of the vapors and avoid contact of the liquid with the skin and clothing. Flush spilled areas with water. Be sure sufficient fresh air enters the area or it should be vacated.

WASTE DISPOSAL METHOD

Used solvent should be recovered by distillation. The residue from distillation may be incinerated, dry welled etc. Check local requirements.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) None necessary when the trichloroethylene is used in a properly designed and operated degreaser or machine.

VENTILATION	LOCAL EXHAUST Sufficient to maintain TLV	SPECIAL During Clean-outs: Tanks are to be completely
	MECHANICAL (General) Avoid drafts over or at degreasers	XOTHER emptied and aired or flushed with water.

PROTECTIVE GLOVES Normally not necessary (Neoprene)

EYE PROTECTION Normally not necessary (glasses/goggles)

OTHER PROTECTIVE EQUIPMENT When cleaning tanks never enter until safe or use air respirator. Use buddy system

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Avoid spillage and leak causing accidents.

OTHER PRECAUTIONS

Avoid spillage, repeated contact with the skin and prolonged breathing of the vapors.

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Hydrocarbon Solvents

Aromatics • Aliphatics • Chemicals • Solvents Rule 66
Solvents – Oxygenated, Chlorinated

@CHARTERCHEMICALS

CHARTER INTERNATIONAL OIL COMPANY

P.O. BOX 5008, HOUSTON, TEXAS 77012 (713) 923-1651

Hydrocarbon Chemicals

CHEMICALS	DISTILLATION °F					EVAPORATION RATES				GRAVITY			SOLVENCY RATINGS			FLASH	TYPICAL COMPONENTS			
	IBP	10%	50%	90%	D.P.	Seconds				n-Bu-Ac = 7.8	Pounds Per Gallon	°API	Sp. Gr. 60/60°F	Aniline Point	Kauri- Butanol Value	Solubility Parameter	°F	Olefins	Naph- thenes	Aro- matics
						10%	50%	90%	TOTAL											
Paraxylene	137.9°C				138.5°C															
Ethylbenzene	275				277	74	371	668	744	0.5	7.280	28.5	0.867 @20°C		95.5	8.5	20		98.5%	Ethylbenzene
Benzene (Nitration Grade)	(1°C Spread Inc. 80-1°C)									5.6	7.355	28.1	0.8633			8.5	12			
High Purity Normal Hexane	155	155	156	156	156															
High Purity Normal Heptane	206	209	209	210	211	13	64	116	129	4.3	5.781	73.3	0.6905	135	27.5	7.4	28	59.5	0.5	0.2 0.2
High Purity Normal Octane	257	257	259	259	260	39	203	366	408	1.4	5.904	69.0	0.7055	161	28.2	7.5	61	97.0	0.5	2.0 0.5
Cyclohexane	(Max 1°C Inc. 8-11°C)																			

Espesol Aromatics

AROMATIC SOLVENTS	DISTILLATION, °F					EVAPORATION RATES				GRAVITY			SOLVENCY RATINGS			FLASH	TYPICAL COMPONENTS		
	IBP	10%	50%	90%	D.P.	Seconds				n – BuAc = 1.0	Pounds Per Gallon	°API	Sp. Gr. 60/60°F	Aniline Point	Kauri- Butanol Value	Solubility Parameter	°F	Olefins	Aromatics
						10%	50%	90%	TOTAL										
Toluene	(1°C Spread Incl. 118.6°C)																		
Xylene	Less than 5°C Spread 137°C Min. Max. 144°C																		
Espesol 1	313	322	325	335	345	389	1,054	2,257	2,300	—	7.387	28.0	0.8871	(1:1)18°C	86.0	8.6	142		95.0
Espesol 2	362	366	373	387	406	1,013	6,017	13,649	17,034	—	7.327	29.3	0.8800		85.5	8.5	104		94
Espesol 3E	308	325	345	367	410	278	1,649	12,955	—	—	7.327	29.3	0.8800		85.5	8.5	104		94
Espesol 4-P	443	462	475	497	544EP	—	—	—	—	—	6.328	10.0	1.0000	(1:1)12.2°C	100+	8.8	200+		99+
Espesol 5	274	277	279	286	326	75	360	768	1,054	0.5	7.198	30.7	0.8888		81.8	8.6	91		95
Espesol 5X	274	278	279	281	284	74	359	719	806	0.7	7.204	30.5	0.8884		81.8	8.6	75		95
INTERMEDIATE SOLVENTS																			
Espesol 1000	324	330	338	354	373	327	1,995	4,868	5,664	0.1	7.075	35.0	0.8496	(1:1)32°C	90.5	8.4	114	0.5	74
Espesol 2000	360	366	375	385	403	980	6,124	13,660	18,074	—	7.184	35.2	0.8581	(1:1)38.8°C	87	8.4	140	0.5	89
Espesol 3031	313	324	334	350	383	345	1,391	3,763	4,572	0.1	6.444	51.5	0.7791	141°F	50	7.7	105	0.5	12
Espesol 3135	317	327	337	356	371	270	1,730	4,320	5,338	0.1	6.413	52.2	0.7703	147°F	33.7	7.7	107	1	9
Espesol 5131	301	308	317	332	342	167	1,045	2,424	2,891	0.2	7.021	36.3	0.8433		75	8.5	90	0.5	77
Espesol 7200	234	239	246	268	272	29	164	387	448	1.3	6.548	48.4	0.7865	(1:1)46°C		8.0	42	0.4	47
Espesol 7200-A	221	226	235	241	261	21	115	265	325	1.5	6.555	48.5	0.7865	(1:1)43.0°C		8.0	42	0.4	47
Espesol 7200-B	221	227	235	252	269	25	154	274	325	1.1	6.555	48.5	0.7865		45	8.0	42	0.4	47

Esposol Aliphatic Solvents

ALIPHATIC SOLVENTS	D'STILLATION ° F				EVAPORATION RATES				GRAVITY			SOLVENT RATINGS				TYPICAL COMPONENTS	
	IRP	10%	50%	90%	D.P.	Seconds			Pounds Per Gallon	Sp. Gr. 60°F	API	Boiling Point	Kauri-Conrad Value	Solubility Parts per 100	Flash	Odors	Aromatics
						10%	50%	TOTAL	n-Bu-Ac = 1.0								
Esposol 100-66	145	156	184	194	196	15	80	158	3.1	6.113	62.1	131	38	7.5	31	1	9
Esposol 206-66	216	219	223	232	235	18	97	190	2.6	6.491	50.0	96	57	8.0	34	1	41
Esposol 207	217	220	225	230	235	24	129	240	2.1	6.065	63	149	32	7.4	42	1	5
Esposol 210-66	215	218	222	232	238	15	80	158	3.1	6.113	62.1	131	38	7.5	31	1	9
Esposol 215	217	220	223	231	236	18	97	190	2.6	6.491	50.0	96	57	8.0	34	1	41
Esposol 230-66	232	235	238	241	244	24	129	240	2.1	6.065	63	149	32	7.4	42	1	5
Esposol 233-K-66	281	284	287	290	293	25	139	279	1.7	6.094	61.8	145	32.8	7.5	52	2	9
Esposol 236-66	232	234	236	238	240	24	129	240	2.1	6.065	63	149	32	7.4	42	1	5
Esposol 250	250	255	259	263	267	25	139	279	1.7	6.094	61.8	145	32.8	7.5	52	2	9
Esposol 250-66	247	251	256	265	272	25	139	279	1.7	6.094	61.8	145	32.8	7.5	52	2	9
Esposol 250-C	248	253	260	268	275	39	221	438	1.1	6.402	52.5	101	44	7.8	52	2	32
Esposol 256-T-66	244	247	252	266	272	26	150	320	1.6	6.219	57.9	125	36.5	7.7	47	2	19
Esposol 260-H-66	262	267	272	281	284	50	277	505	1.0	6.100	53.0	100	45.7	8.0	109	2	34
Esposol 260-66	261	262	264	268	267	75	300	533	0.7	6.000	59.0	100	45.7	8.0	109	2	34
Esposol 300	323	331	346	361	372	302	435	817	0.1	6.548	48.4	128	38.4	8.1	102	0.4	19
Esposol 300-66	325	338	354	368	375	326	439	818	0.1	6.466	50.7	146	33	7.6	107	1	5
Esposol 300-S	320	328	338	352	368	291	407	734	0.1	6.694	44.5	100	45.7	8.0	109	2	34
Esposol 308	309	315	321	333	346	192	243	438	0.1	6.548	48.4	128	38.4	8.1	102	0.4	19
Esposol 310-66	310	314	318	322	326	192	243	438	0.1	6.548	48.4	128	38.4	8.1	102	0.4	19
Esposol 311	308	312	316	320	324	192	243	438	0.1	6.548	48.4	128	38.4	8.1	102	0.4	19
Esposol 312	307	311	315	319	323	192	243	438	0.1	6.548	48.4	128	38.4	8.1	102	0.4	19
Esposol 380-66	358	369	381	430	518EP	952	6,416	30,364	-	6.357	53.8	186	26.0	7.3	136		2

LACQUER Diluent
 Rubber Solvent
 VM & P Naphtla
 Short Range
 MINERAL Spirits

Espesol Solvents For Rule 66

SOLVENTS FOR RULE 66	DISTILLATION °F					EVAPORATION RATES					GRAVITY			SOLVENCY RATINGS			FLASH	TYPICAL COMPONENTS	
	IBP	10%	50%	90%	D.P.	Seconds				n-Bu-Ac = 1.0	Pounds Per Gallon	°API	Sp. Gr. 60/60°F	Aniline Point	Kauri- Butanol Value	Solubility Parameter	°F	Olefins	Aromatics
						10%	50%	90%	TOTAL										
Esposol 210-66	215	218	222	232	238	15	80	158	182	3.1	6.113	62.1	0.7309	131	36	7.6	31	1	9
Esposol 230-66	232	236	238	241	244	24	129	240	270	2.1	6.065	63	0.7275	149	32	7.4	42	1	5
Esposol 233-66	232	234	236	242	244	24	127	244	275	2.1	6.223	57.8	0.7475	119	39.5	7.7	42	1	19
Esposol 250-66	247	251	256	265	272	26	139	279	320	1.7	6.094	61.8	0.7320	145	32.8	7.5	52	2	9
Esposol 260-H-66	262	267	272	281	284	50	277	555	629	0.9	6.090	61.9	0.7316	154	30	7.4	65	1	5
Esposol 280-66	281	282	284	286	287	75	380	693	774	0.7	6.094	61.8	0.7320	158	30	7.4	81	1	3
Esposol 310-66	313	321	332	343	347	224	1,476	3,221	3,713	0.2	6.385	53.0	0.7669	154	31.4	7.6	102	0.3	3
Esposol 350-66	360	364	368	373	377	640	4,632	9,042	10,266	—	6.516	49.3	0.7826	152	33.5	7.7	141	0.8	6

Oxygenated Solvents

DISTILLATION RANGE		EVAPORATION RATE GAL./HR.	GRAVITY		Coefficient of Expansion at 20°C per °C	Flash TOC °F	DILUTION RATIO		SOLUBILITY PARAMETER
Boiling Point	Distillation Range		At 60°F Lbs./Gal.	Sp. Gr.			Aromatic	Aliphatic	
114-117	114-117	1.00	6.57	.708	.00111	60	Latent		11.46
118-120	118-120	1.00	6.74	.809	.00095	90	Latent		11.9
119-121	119-121	1.00	6.88	.797	.00143	15	4.4	0.8	9.63
120-122	120-122	1.00	6.75	.810	.00129	22	4.3	0.9	9.3
120-122	120-122	1.00	7.42	.891	.00134	42	3.1	1.3	9.1
120-122	120-122	1.00	7.37	.885	.00113	65	2.9	1.3	8.8
120-122	120-122	1.00	7.37	.885	.00113	65	2.9	1.3	8.8

ALSO AVAILABLE ARE OTHER ALCOHOLS, KETONES, ESTERS, GLYCOLS, AMINES, CHLORINATED SOLVENTS

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing,
Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

Chemtrec No.

(800) 424-9300

MANUFACTURER'S NAME

EMERGENCY TELEPHONE NO.

Independent Petrochemical Corporation

(713) 923-6641

ADDRESS (Number, Street, City, State, and ZIP Code)

3930 Chouteau Ave., St. Louis, Missouri 63110

CHEMICAL NAME AND SYNONYMS

N/A

TRADE NAME AND SYNONYMS

IPC-1258

CHEMICAL FAMILY

Chlorinated Hydrocarbon Solvents

FORMULA

N/A

66% METHYLENE CHLORIDE
34% CHLOROFORM N.U.

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS	100	265ppm	FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)
N/A					

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	106°F	SPECIFIC GRAVITY (H ₂ O=1)	1.3000
VAPOR PRESSURE (mm Hg.)	196.0	PERCENT, VOLATILE BY VOLUME (%)	100%
VAPOR DENSITY (AIR=1)	3.90	EVAPORATION RATE (n-BuAc = 1)	14.6
SOLUBILITY IN WATER	Negligible		
APPEARANCE AND ODOR	White Water Liquid with sharp pugniant odor.		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	TCC = None	FLAMMABLE LIMITS	N/A	Lel	Uel
EXTINGUISHING MEDIA	(1) Mechanical Foam, (2) Dry Chemical, (3) Water Fog, (4) CO ₂				
SPECIAL FIRE FIGHTING PROCEDURES	N/A				
UNUSUAL FIRE AND EXPLOSION HAZARDS	N/A				

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

265 PPM

EFFECTS OF OVEREXPOSURE

to vapors might damage central nervous system and cause respiratory irritation, muscular weakness, confusion, impaired coordination, headache and nausea.

EMERGENCY AND FIRST AID PROCEDURES

Skin Contact: Wash immediately with soap and water. Eye Contact: Wash immediately with plenty of water for 15 minutes. Inhalation: Remove from exposure. Provide fresh air and rest. Use artificial respiration if needed. Ingestion: Do not induce vomiting. Call a physician immediately. See Note To Physician.

SECTION VI - REACTIVITY DATA

STABILITY

UNSTABLE

CONDITIONS TO AVOID N/A

STABLE

X

INCOMPATIBILITY (Materials to avoid)

Avoid strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS

Phosgene, HCL, CL₂

HAZARDOUS
POLYMERIZATION

MAY OCCUR

CONDITIONS TO AVOID N/A

WILL NOT OCCUR

X

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Remove all possible ignition sources. Avoid breathing vapors. Provide adequate ventilation. In case of spillage, absorb and dispose of in accordance with local applicable regulations. Call emergency number if spillage poses threat to man or environment.

WASTE DISPOSAL METHOD

Dispose in accordance with local, state and federal regulations. Use qualified disposal company to incinerate, or otherwise discard, at an approved facility. Do not incinerate closed containers.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)

If TLV is exceeded, use self-contained breathing apparatus.

VENTILATION

LOCAL EXHAUST

SPECIAL

To a danger safe area

N/A

MECHANICAL (General)

OTHER

N/A

N/A

PROTECTIVE GLOVES

EYE PROTECTION

Use chemical resistant

Use safety goggles

OTHER PROTECTIVE EQUIPMENT

As required to avoid skin contact or breathing vapors.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Keep closures tight and upright to prevent leakage. Keep closed when not in use. Do not transfer to unmarked container. Read all warning labels. Store in cool, well ventilated area. Ground containers when filling or emptying.

OTHER PRECAUTIONS

*Adequate means equivalent to outdoors ventilation.

INDEPENDENT PETROCHEMICAL CORP.

SOLVENTS — INDUSTRIAL NAPHTHAS — CHEMICALS

7700 CLAYTON ROAD • SUITE 203 • RICHMOND HEIGHTS, MISSOURI 63117 • 314-781-9500

IPC-1258

NOTE TO THE PHYSICIAN: EPINEPHRINE AND OTHER DRUGS WITH SIMILAR ACTIVITY ON THE HEART MAY PRODUCE SERIOUS ARRYTHMIAS AND SHOULD NEVER BE GIVEN TO A PERSON OVERCOME WITH ANY CHLORINATED HYDROCARBON, PARTICULARLY WHEN THERE IS COEXISTENT ANOXIA.

SUPPLIERS OF



CHARTER CHEMICALS



Product Guide

FR Hydraulic Fluid

Permissible Fire-Resistant Hydraulic Fluid MSHA Approval No. 30-32-1

CONOCO FR Hydraulic Fluid is a low cost, fire resistant hydraulic fluid of the water-in-oil (invert) emulsion type. It is pre-mixed, ready-to-use, and contains 40% by volume of water. This water content results in excellent fire resistance compared with conventional petroleum oils.

A wide variety of industrial hydraulic oil requirements are satisfied with FR Hydraulic Fluid.

Customer Benefits

- Excellent fire resistance
- Low cost
- Good antiwear properties
- Rust inhibited for system protection
- Little special system preparation necessary if changing from petroleum oil
- Cooler running systems
- Approved by the Mining Enforcement and Safety Administration of the Department of the Interior
- Approved by *Factory Mutual System* as a fire resistant fluid

CONOCO FR Hydraulic Fluid is manufactured from high quality petroleum-base oil and fortified with antiwear agents, rust inhibitors, and special emulsifiers to produce a homogeneous mixture of maximum stability.

Little system preparation is necessary if changing from a petroleum oil or water-glycol fluid to FR Hydraulic Fluid. Cork or butyl seals or packing should be avoided as they tend to swell in FR Hydraulic Fluid.

Filters and strainers on the pump inlet side of the system should be avoided as should absorbent filters such as waste-packed or fuller's earth units. Paper filters should only be used if their manufacturer provides assurance that they are compatible with water-containing fluids.

Systems should be operated under 2000 psi and temperatures should not exceed 150°F. if excessive water loss is to be avoided. Most systems will operate 5°-15°F. cooler with FR Hydraulic Fluid than with ordinary petroleum or synthetic fluids.

The only special consideration in using FR Hydraulic Fluid is maintaining the proper water content as water is continually lost through evaporation. MSHA requires a minimum of 35% water for adequate fire resistance, and good practice is to maintain water content at 35-40%.

Good practice requires that the fluid not be stored over three months and under no conditions more than six months before use. Storage should be in an area not exposed to sub-freezing temperatures.

A stock solution is available for determining water content in the field.

The Conoco Product Engineer is familiar with test procedures, system changeover, and operating information and should be consulted when changing to this excellent hydraulic fluid.

Package Sizes

55-gallon drum
16-gallon drum
5-gallon pail
Bulk



Marlette Continuous Miner Type 570-WD-ER
National Mine Service

(Continued)

CONOCO FR Hydraulic Fluid
Typical Specifications

Composition	
Oil, Volume %	60
Water, Volume %	40
Gravity, API	22
Specific Gravity	.9236
Pound/gallon	7.68
Appearance	Milky
Viscosity:	
SSU @ 100°F.	500
SSU @ 150°F.	175
cSt @ 40°C.	100
cSt @ 100°C.	18.5
Freeze Point, °F.	-2
pH	7.1

*To continue to provide superior quality, Conoco reserves the right
to change the composition of its products without notice.*

Continental Oil Company
HOUSTON, TEXAS

Rev. 6-78 O

CONOCO FR HYDRAULIC FLUID

MESA Approval No. 30-32-1
Factory Mutual System Approved

CONOCO FR Hydraulic Fluid is a low-cost fire resistant hydraulic fluid of the pre-mixed invert emulsion type, also referred to as water-in-oil type emulsion. It contains 40% water by volume and offers excellent fire resistance compared to conventional petroleum fluids. FR Hydraulic Fluid is formulated with quality lubricating oil stocks that are fortified with anti-wear agents, rust inhibitors and emulsifiers. These stocks are then carefully blended with water to insure a homogeneous emulsion is obtained for maximum stability. The result is a fire resistant hydraulic fluid that satisfies the requirements of a wide variety of industrial equipment.

SYSTEM PREPARATION

Changing a hydraulic system over to the use of FR Hydraulic Fluid generally requires minimal preparation if you are replacing either conventional petroleum hydraulic oils or water-glycol fire resistant fluids. Certain precautions are necessary when FR Hydraulic Fluid is used to replace synthetic fire resistant hydraulic fluids since the seals and packing materials are not generally compatible with petroleum base oils. Viton seals are an exception and can be used with either type of fluid. Cork and butyl seals, packing or gaskets cannot be used with water-emulsion type fluid because water tends to swell cork and oil swells butyl. See attached chart covering acceptable seals, paint, pipe dope, strainers and filters.

When changing over to FR Hydraulic Fluid it is advisable to thoroughly drain and flush the entire system. Invert emulsion fluids tend to remove sludge, dirt and wear deposits left by other fluids and disperse them throughout the system. This cleaning or dispersancy action is attributed to the fluid's greater density or lower gravity. After draining all the oil from the reservoir and low point components, install a charge of FR Hydraulic Fluid. Operate the system for 30 minutes actuating all components. Drain the invert emulsion, clean the reservoir and change or clean the filters. Save the invert emulsion for flushing other systems being converted. Install complete change of new FR Hydraulic Fluid to the system.

Filters, strainers must be given special consideration when invert emulsion type fluids are put into use. Screens and filters should be avoided whenever possible on the suction side of the hydraulic pump to prevent cavitation and pump damage. The recommended filter location is in the return line going to the reservoir. Magnetic filters in the reservoir are beneficial for trapping ferrous wear metals but should be used in combination with paper or metal filters capable of retaining non-ferrous metals, dirt and other contaminants. The filter flow capacity or number of filters used may have to be increased due to this higher density fluid. Paper element filters must be compatible with water. Machine and/or pump manufacturers usually specify filtration in the 10 to 40 micron range. Never use absorbent filters, such as waste packed or Fullers earth anywhere in the system.

SYSTEM OPERATION

FR Hydraulic Fluid will give good pump life when used at pressures under 2,000 PSI and temperatures under 150°F. Higher pressures are permissible with certain piston pumps. The Pump Manufacturer should be contacted for his specifications and recommendations. Ideal fluid temperatures are 100°-120°F, never to exceed 150°F reservoir temperature. Most hydraulic systems will run 50°-150° F cooler with FR Hydraulic Fluid than they would with ordinary petroleum or synthetic products. Exceeding pump speed specifications and/or operating at temperatures over 150°F will cause cavitation and high rates of water loss along with accelerated pump wear.

To help avoid cavitation, it is advisable to maintain a slight pressure head on the pump inlet. Pump inlet vacuum should never be allowed to exceed 5" of mercury. Inlet piping should be as large as possible and kept as short and straight as practical.

SYSTEM MAINTENANCE

The only special consideration involving FR Hydraulic Fluid is maintaining the proper ratio of water to oil in the invert emulsion. Water content should be kept between 35% and 40%. U.S.B.M. regulations require a minimum water content of 35% by volume for proper fire resistance. Since the viscosity of the emulsion increases with the addition of water, the water content should not be allowed to exceed 40% by volume. (See attached chart). Periodic tests for water content must be made because of the constant loss of water by evaporation. High fluid temperatures will accelerate water loss.

The following procedure will give an accurate field check on water content:

1. Prepare a stock solution of:
1000 ml. benzene
1000 ml. normal butanol
162 ml. concentrated hydrochloric acid
2. Add 80 ml. of stock solution to 100 ml. of FR Hydraulic Fluid, in 250 ml. graduate, mix well.
3. Let mixture stand for at least 1/2 hour or until separation of water and oil is complete.
4. The percent water by volume is read directly in ml. after subtracting 6 ml. to correct for the water content of the acid.

If this analysis shows the water content to be below 35%, then add clean drinking water very slowly at the pump inlet while the system is in operation. Add enough water to bring the content back to the required 35%-40%.

When additional FR Hydraulic Fluid must be added as makeup, agitate the new fluid briefly before addition. Invert emulsions do separate slightly in storage, but agitation will assure a homogeneous mixture. New stocks should be used within six months when stored above freezing temperatures.

TEST DATA

Flammability

FR Hydraulic Fluid passes the flammability requirements of the U.S.B.M. Schedule 30 procedures which are described as follows:

1. Autogenous Ignition Temperature Test - the temperature at which the fluid will catch fire when heated without an ignition source must be over 600°F.

2. Temperature - Pressure Spray Ignition Test - Atomized fluid must not ignite or propagate flame within a period of one minute when pressure sprayed into three ignition devices:

- a. Burning cotton waste soaked with kerosene.
- b. 12,000 volt electric arc.
- c. Propane torch.

3. Evaporation Flammability Test (Pipe Cleaner Test) - this test measures the change in fire resistance brought about by evaporation of portions of the water content.

Emulsion Stability

FR Hydraulic Fluid is stable in both storage and service. Unstable emulsions that separate can cause severe pump damage. Several accelerated stability tests were used in the development of FR Hydraulic Fluid. It satisfactorily passes the stability requirements of storage for two days at 185°F, one month at room temperature, one month at 150°F, and freeze-thaw cycles plus one hour heat test.

Wear Protection

The Vickers Pump Test is a laboratory test used to determine the anti-wear properties of hydraulic fluids. FR Hydraulic Fluid compares favorably to conventional hydraulic oils in this test when it is used at pressures below 1,000 PSI and temperatures below 150°F.

Toxicity

Complete toxicity tests have been run on FR Hydraulic Fluid and it is rated as non-toxic as defined in the Federal Hazardous Substances Labeling Act.

HANDLING AND STORAGE INSTRUCTIONS

Viscosity

This product will pour and handle much like an SAE 30 oil, except it will tend to thicken more quickly as temperature continues to drop below freezing. Product viscosity is controlled by the percent of water used, therefore container caps must be replaced and tightened to avoid water evaporation and contamination.

Shelf Life

Six months is typical period of time product will remain a homogeneous emulsion, providing it is stored above freezing temperature (32°F).

Shelf Life (Cont'd)

Two months is average time for product subjected to freeze-thaw conditions.

All drums and containers have a filling date. We highly recommend stock rotation, first in, first out. Product used within the six months or two months period mentioned above, require no special handling during this period.

Oil and Water Separation

1. A small layer of oil on top is considered normal plus it helps control water evaporation.
2. Separation will start to occur with extended storage or after several cycles of freezing and thawing.
3. Product quality is not affected providing it can be reblended together by agitating, rolling the drum or stirring. Bulk tank storage requires recirculating pump system. Product temperature must be above 32°F (50°F to 70°F preferred) before reblend is possible.
4. Frozen product must be heated evenly such as in a heated room or water bath. Immersion heaters with high skin temperatures must never be used because they will cause separation.
5. Product that has separated and is considered unusable or will not reblend must be disposed of locally. It is uneconomical to return to manufacturer.

Bulk Storage Tanks

- Should be insulated to retard freezing.
- Should have product recirculation system available in the event of freezing or long down periods.
- Should have an electrically driven pump and hose for filling containers.

General Comments

Use clean containers.

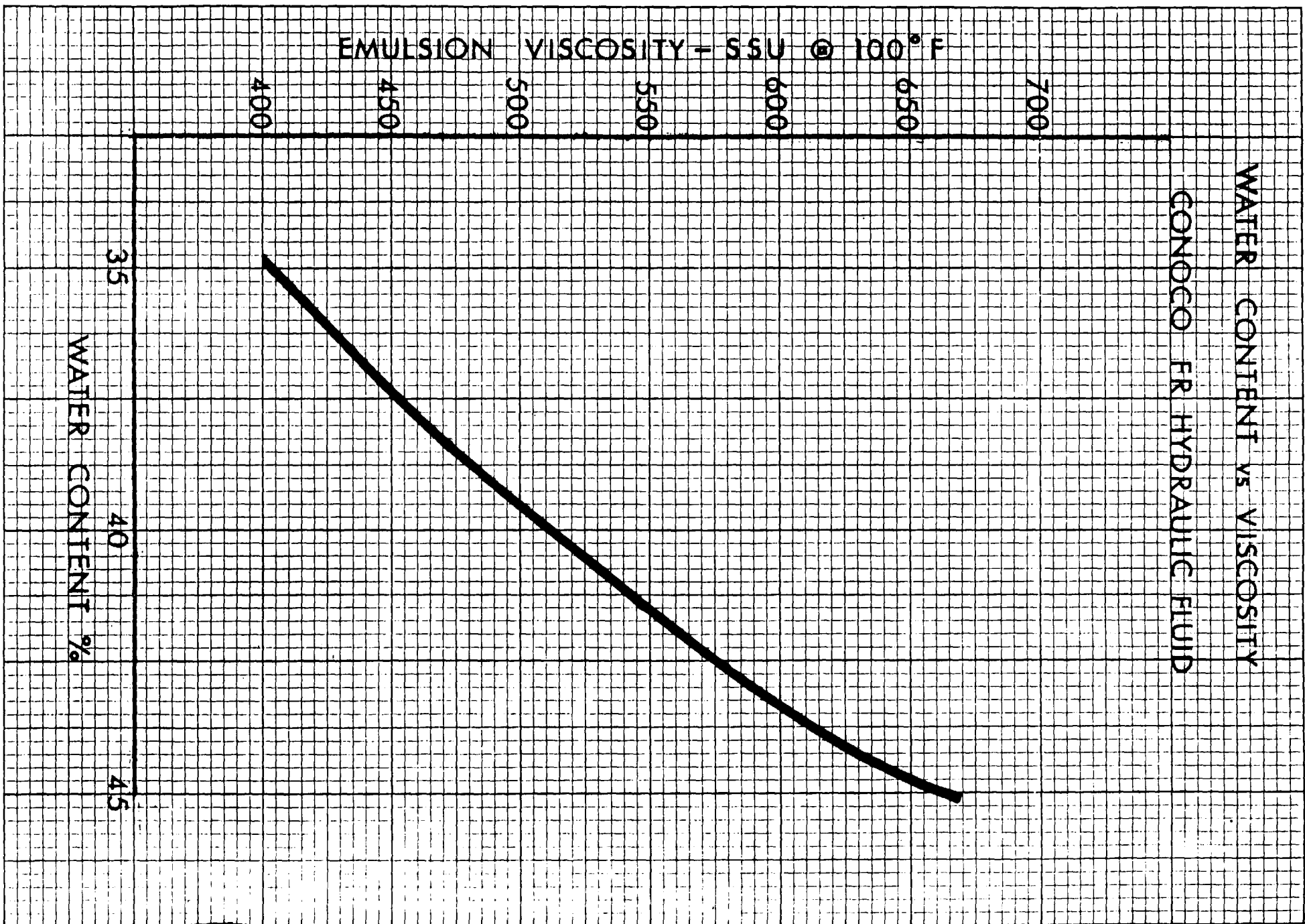
Do not mix different brands of product.

Always use a homogeneous product for best possible pump life.

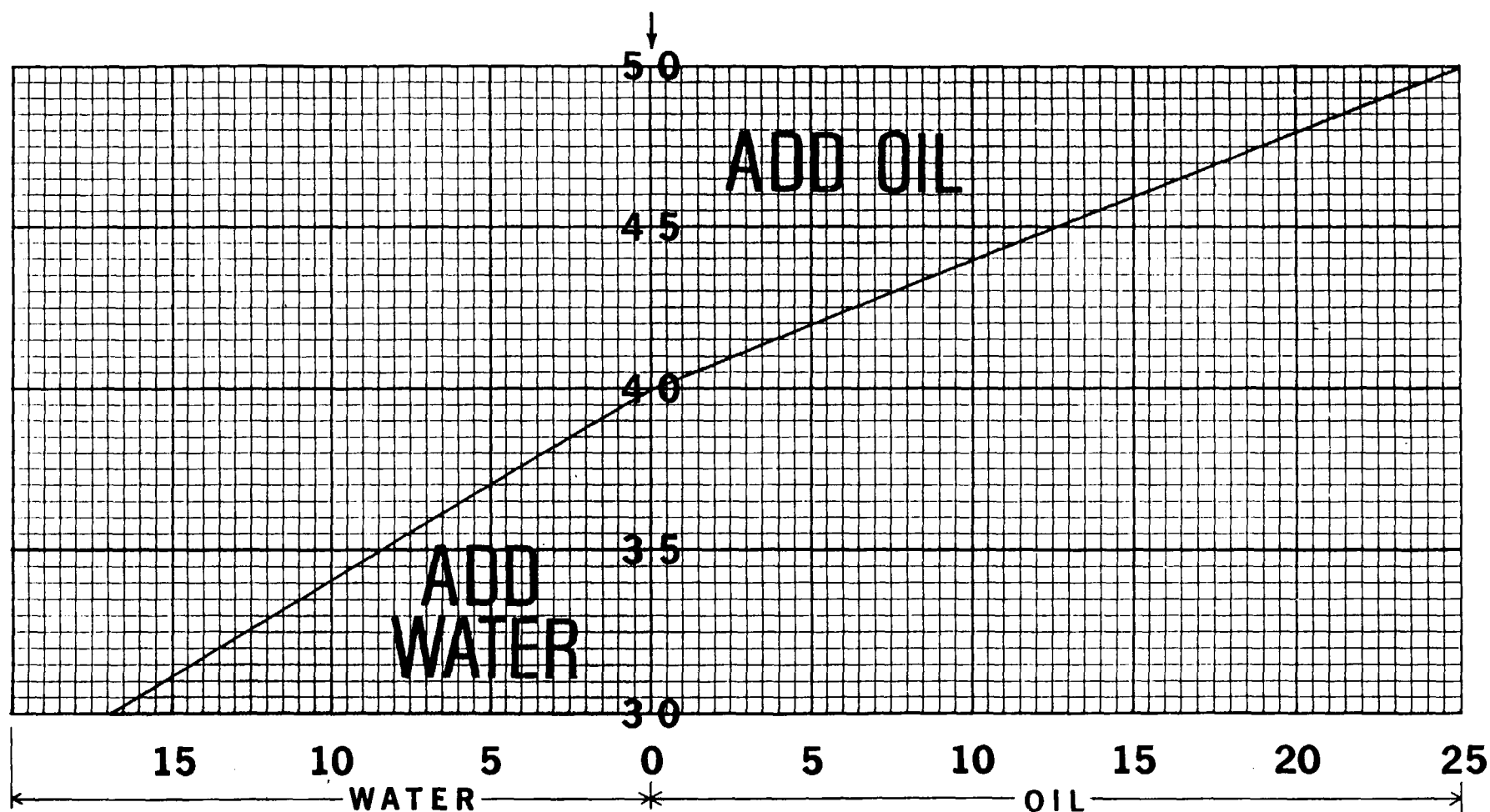
Follow drain - refill intervals specified by equipment manufacturer.

TYPICAL SPECIFICATIONS

Composition	
Oil, volume %	60 .
Water, volume %	40
Gravity, API	22
Specific Gravity	.9236
Lbs./Gallon	7.684
Appearance	Milky White
Viscosity, SSU @100°F	500
@150°F	175
@210°F	82
Freeze Point, °F	-2
P _h	7.1



WATER CONTENT % VOLUME



Gallons to be added per 100 gallons of emulsion
to provide 40% water and 60% oil.

FIRE RESISTANT FLUID CONVERSION CONSIDERATIONS

Water Base Fluids							
Specific Consideration	Petroleum Oil	Oil & Water Emulsion	Water-Glycol Mixture	Chlorinated Materials	Mixtures of	Phosphate Esters	Petroleum Diluted Synthetics
Acceptable Seal and Packing Materials	Neoprene, Buna N	Neoprene, Buna N (no cork)	Neoprene Buna N (no cork)	Silicone, Viton, EP, Teflon, Butyl (with caution) *	Silicone, Viton, EP, Teflon, Butyl (with caution) *	Viton, Butyl Silicone, Teflon, EP rubber	Viton, Silicone, Teflon
Acceptable Paints	Conventional	As recommended by fluid supplier	As recommended by fluid supplier	"Air cure" epoxy as recommended	"Air cure" epoxy as recommended	"Air cure" epoxy as recommended	"Air cure" epoxy as recommended
Acceptable Pipe Dopes	Conventional	Conventional	Pipe dopes as recommended, "Loctite" or equivalent, Teflon tape	Pipe dopes as recommended, "Loctite" or equivalent, Teflon tape	Pipe dopes as recommended, "Loctite" or equivalent, Teflon tape	Pipe dopes as recommended, "Loctite" or equivalent, Teflon Tape	Pipe dopes as recommended, "Loctite" or equivalent, Teflon tape
Acceptable Suction Strainers	100 mesh wire, 1½ times pump capacity	40 mesh wire, 4 times pump capacity	50 mesh wire, 4 times pump capacity	50 mesh wire, 4 times pump capacity	50 mesh wire, 4 times pump capacity	50 mesh wire, 4 times pump capacity	50 mesh wire, 4 times pump capacity
Acceptable Filters	Cellulose fiber 200-300 mesh wire, knife edge or plate type	Glass fiber 200-300 mesh wire, knife edge or plate	Cellulose fiber 200-300 mesh wire, knife edge or plate	Cellulose fiber, 200-300 mesh wire, knife edge or plate type (Fuller's Earth or micron type may be used on non additive fluids.)			
Acceptable Metals of Construction	Conventional	Conventional	Avoid Galv., zinc, and cad. pltg.	Conventional	Conventional	Conventional	Conventional

* Butyl swells moderately in this type of fluid

GULF FR FLUID

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General Characteristics

Gulf FR Fluid is a 40% water-in-oil emulsion fire-resistant hydraulic fluid. Each drop of water is coated with oil. The oil lubricates and protects against rust, wear and foam while the water provides the necessary fire resistance.

The oil phase is a mineral lubricating oil containing special additives to stabilize the emulsion, improve lubricity, and suppress foaming. The fluid also contains an additive to make possible low temperature pumpability, so that it may be used in equipment at 0°F after overnight shutdown and as low as 10°F after weekend shutdown.

Gulf FR Fluid is delivered ready for use. Gulf FR Fluid has been approved by Factory Mutual. It has also been tested and approved by the U.S. Bureau of Mines under Schedule 30 as a permissible fire-resistant hydraulic fluid. U.S.B.M. Approval No. 30-7 has been assigned to Gulf FR Fluid.

Bureau of Mines approval is based on tests conducted by the Bureau to determine the fluid's fire resistance under prescribed test conditions. (Performance as a hydraulic fluid

or lubricant is not formally evaluated by the Bureau of Mines.)

The fluid contains an effective antiwear additive. It has been approved by Denison Division of Abex Corp., against standard HF-3 and by U.S. Steel Corporation against Requirement No. 168.

Recommendations

Gulf FR Fluid is recommended for all hydraulic applications where a fire-resistant emulsion-type fluid having U.S. Bureau of Mines approval is desired.

In addition to underground mining, other applications have been developed, such as hydraulic presses and other hydraulically-operated equipment where the requirement is fire resistance at reasonable cost.

The proper operation of any hydraulic system depends upon keeping the fluid free from contamination. Cleanliness is particularly important with an emulsion-type fluid because the emulsion is heavier than oil and the higher gravity enables it to circulate certain larger and

heavier dirt particles which would settle out of a petroleum hydraulic oil. Therefore Gulf FR Fluid should be carefully stored and handled.

Though FR Fluid is quite stable, any emulsion may show some separation during storage. It is recommended that containers be rolled or shaken immediately before use to agitate the contents and insure an emulsion with the proper water and oil proportions.

Typical Properties

	Gulf FR Fluid
Specific Gravity, 60/60F	0.9478
Viscosity, SUV:Sec., (ASTM D88)	
100°F	400
150	152
175	108
210	73.1
Color (Appearance)	creamy white, opaque
Neutralization Value (ASTM D 974)	
Total Acid No.	0.75
Water, by distillation: % (ASTM D 95-58)	40

SP-14375

ASK THE PRO FROM GULF



Gulf Oil Corporation
Department DM
P.O. Box 2100
Houston, Texas 770

HOUGHTO-SAFE® 5046-W

**emulsion fire-resistant hydraulic fluid
minimizes rust and slime build-up;
excellent at low temperatures**

Houghto-Safe 5046-W is an improved high performance water-oil emulsion fire-resistant fluid. New formulation improves low temperature handling and storage characteristics, to keep your winter operating problems at a minimum. This same formulation reduces slime build-up and increases rust inhibition. Valves and lines in your system stay cleaner which results in a smoother and more efficient operation.

5046-W has wear and stability capabilities that exceed those of other emulsion fluids. You get longer pump life and an emulsion that resists separation. The greater capabilities of 5046-W result from improved chemical formulation and modern manufacturing techniques. The dependability of 5046-W can reduce your production problems and keep downtime at a minimum.

Typical physical properties

Emulsion fluids have non-Newtonian flow characteristics. That is, viscosity will vary according to rate of shear. Here are typical viscosity characteristics at low shear rates (about 100 reciprocal seconds):

SUS Viscosity at 130°F.	215 seconds
100°F.	450 seconds
70°F.	1100 seconds
Viscosity Index	130
Specific Gravity at 60°F.	0.96
Water Content	38%
Ice Crystallization Point	0°F.
Pour Point (ASTM)	-30°F.
Pounds per Gallon	7.99
Color	Milky White

Special additives

Ice crystallization point depressant	—Resists freezing under rigorous winter conditions.
Vapor phase corrosion inhibitor	—Provides protection against rust in vapor phase.
Bacteriostat	—Prevents biological slime build-up.
Anti-wear additive	—Gives longer pump life at high pressures.

Features

- Economical protection where potential fire danger is not primary.
- Excellent stability.
- Passes the U. S. Steel Low Temperature Immersion Cycling Test.
- Improved anti-wear characteristics.
- Superior vapor phase and liquid phase corrosion protection.

Bacteriostatic protection

Hydraulic systems provide excellent breeding environments for bacteria and fungi. Under the right conditions microorganisms will quickly multiply and cause slime formations. These can clog intake strainer screens, leading to cavitation and premature pump failure. Houghto-Safe 5046-W, with its bacteriostatic agent, has shown a bacteria kill rate of better than 99 percent in laboratory tests. The possibility of biological slime build-up is prevented with 5046-W's bacteriostatic protection.

Stability

The new properties of Houghto-Safe 5046-W make it much more stable than competitive emulsion fluids. Prolonged storage, temperature cycling and pump tests indicate excellent resistance to oil and water separation.

Storage tests conducted at room temperature for a six month period showed no decrease in stability. After one week at 150°F., stability still remained constant.

Houghto-Safe 5046-W has a special anti-freeze additive, to give superior low temperature properties. 5046-W can be safely handled and stored at temperatures well below 32°F. This characteristic makes it ideal for those industries whose climates make conventional emulsions totally unsuitable. Winter conditions can expose a fluid to tempera-

(OVER)

tures which alternate above and below freezing. Continuous casting operations in steel mills are often subjected to these conditions.

Houghto-Safe 5046-W's stability isn't affected by these variations in daily winter temperatures. This unique benefit is not found in other emulsion fluids—another reason to select 5046-W.

Pump tests

Tests were conducted on Houghto-Safe 5046-W in a Vickers VK-105-A at 130°F.

Test conditions:

Test period	1,000 hours
Pressure	1,000 psi
Flow rate	5 gpm

Test results after 1,000 hours:

Less than 0.05% weight loss! When pressure was increased to 1500 psi, pump life was still good. This pressure increase is 50% above the maximum catalog rating of the pump.

Tests were conducted in a Vickers V-104-A vane-type pump at 130°F.

Test conditions:

Test period	1,000 hours
Pressure	1,000 psi
Speed	1,200 rpm

Test results after 1,000 hours:

Wear on ring	0.123 gm
Wear on vane	0.003 gm

In a high-performance vane pump at pressure of 2,000 psi total wear on moving parts was only 0.1%, after 500 hours of testing. Houghto-Safe 5046-W is suitable for use in many types of modern hydraulic pumps.

Operating with

Houghto-Safe 5046-W

Houghto-Safe 5046-W is shipped containing approximately 38% water. Performance is typically normal when water content is maintained between 33% and 43%.

Contamination and extent of shear in operation will affect the viscosity of the fluid. The recommended operating temperature is 50°F. to 120°F.

Water content should be checked at regular intervals.

How to determine the water content of Houghto-Safe 5046-W

Two methods are suggested—distillation or solvent split. The distillation method is more accurate, especially in the presence of contaminants. But the solvent split method is simpler faster and does not require costly equipment.

Solvent Split Method

1. Into a clean, dry, 100-ml. graduated cylinder place 50-ml. of a solvent mix made of 60 parts DuPont Duco Thinner No. 36508 and 40 parts normal butanol.
2. To the cylinder add 50-ml. of the Houghto-Safe 5046-W from the system.
3. Tightly close the cylinder and shake vigorously by hand.
4. Allow the cylinder to sit undisturbed for 15 minutes, or until complete phase separation occurs.
5. The present water content is determined by subtracting 2 ml. (to allow for anti-freeze content) from the number of ml. of water (bottom layer) and multiplying the remainder by 2.

Water Adjustment Chart

Percent Water Content in System	Gallons of Water* to Add Per 100 Gallons of Fluid
33 or higher	Add no water
32	10
29	15
26	20
23	25
20	30

*Use distilled, de-ionized or boiler condensate. Add very slowly to system.

Shipping

Houghto-Safe 5046-W is shipped in tank cars and in 55-gallon (U.S.) drums. Weight: 7.99 lbs./gal.

E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia, Pa. 19133. Other plants: Carrollton, Ga., Chicago, Detroit, Manchester, Conn., So. San Francisco, Toronto, Canada. Sales offices in principal cities.

The HOUGHTON Line



Product Guide

Soluble Oil

At information

Compounded, Water Emulsifying Oils for Metal Working Operations

CONOCO Soluble Oil is a carefully balanced blend of a high quality mineral oil and emulsifying agents. It mixes readily with water in ratios as high as 100 parts of water to 1 part of oil.

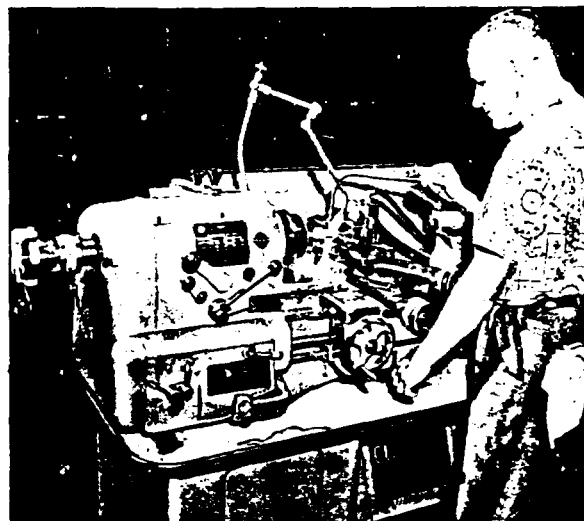
CONOCO Soluble Oil is a general purpose product, recommended for a wide variety of cutting and grinding operations where a water soluble lubricant and coolant is used.

Customer Benefits

- Permits maximum production output
- Increases tool life
- Outstanding work finish
- Excellent cooling ability
- Forms stable emulsions even with hard water
- Provides excellent rust protection for machined parts
- Very economical

Two important maintenance items are vital for optimum soluble oil performance. First, the correct oil-water proportions should be maintained. Water loss due to evaporation will enrich the emulsion, while filtration of used fluid will remove oil and lean the emulsion. Second, a program to prevent growth of odor-causing bacteria should be carefully followed. Such a program should consist of regular treatment of the soluble oil system with a germicide and the periodic draining and cleaning of the system with a disinfectant solution. Germicides added to the oil at the factory are not effective in controlling bacteria for long after they are mixed with water in a circulating system. A maintenance program like this must be carried out by the user to achieve the maximum benefit of the high quality built into the CONOCO Soluble Oil Formulation.

For assistance in determining the best oil-water proportions for a specific metal working operation, a Conoco Product Engineer should be contacted.



*Clausing—Colchester Tracer Lathe
Clausing*

Package Size

55-gallon drum

CONOCO Soluble Oil Typical Specifications

Grade	Soluble Oil
Gravity, API	25
Viscosity:	
SSU @ 100°F.	264
SSU @ 210°F.	56
cSt @ 40°C.	50
cSt @ 100°C.	8.9
Color, ASTM	4
Sulfur, %	0.5
Emulsion Stability—90% Water—10% Oil—No Free Oil After Six Hours	

To continue to provide superior quality, Conoco reserves the right to change the composition of its products without notice.

Continental Oil Company
HOUSTON, TEXAS

Rev. 4-78 O

Gulfcut[®] Soluble Oil for Machining and Grinding

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General Qualities and Characteristics

Gulfcut Soluble Oil is a specially compounded emulsifying product composed of a petroleum oil and special emulsifiers. It mixes readily with hot or cold water. It forms homogeneous and exceptionally stable emulsions which show no apparent separation after long periods of usage or storage.

Application Requirements

Metal cutting and grinding operations generate heat. The prime requirement, therefore, is to select a fluid which will reduce generation and increase dissipation of heat. The effectiveness with which this is accomplished has a direct bearing on increasing feed, speed, tool life, and improving surface finish. An efficient and economical way to control heat is to use the excellent cooling properties of water combined with some of the lubricating properties of oil. Additionally, an effective cutting and grinding fluid must contain anticorrosion properties to protect the workpiece during the manufacturing process. Another characteristic which enhances its usefulness is stability, whether in use or in storage.

Recommendations

Gulfcut Soluble Oil emulsions are the preferred choice for grinding and for machining operations where cooling is of the

utmost importance. It meets the basic application requirements described above in a highly satisfactory and economical manner.

Gulfcut Soluble Oil is usually diluted in oil/water ratios ranging from 1:10 to 1:60. Because there are so many variables to be considered from job-to-job, it is impractical to make a specific recommendation of optimum oil to water ratios. However, in general, the richer emulsions are used for the more difficult jobs, the intermediate for the free-machining metals and the lean mixtures are used for such operations as grinding, where massive cooling is required.

Gulfcut Soluble Oil is specially inhibited to give it effective anticorrosion properties. It will prevent corrosion of both ferrous and nonferrous machined metal parts. Workpieces machined with such emulsions ordinarily need no further corrosion protection during subsequent handling or manufacturing processes because the thin film protects for a suitable period.

The properties of Gulfcut Soluble Oil permit production of clean work, excellent surface finish and minimum tool wear. When used as a grinding coolant, emulsions will contribute to long wheel life, accurate tolerances and superior finish.

When preparing emulsions of Gulfcut Soluble Oil and water, always add oil to water. Stability of the emulsion is enhanced when it is put through a homogenization process.

Typical Physical and Chemical Properties

Gravity: °API	21.5
Viscosity, SUV: Sec.	
100 F	200
210 F	43.6
Flash, OC: F	320
Fire, OC: F	350
Pour: F	-20
Color, ASTM D 1500	4.0
Sulfur: %	0.69
Copper Strip Test	
212 F, 3 Hr.	1
Corrosion Test (x)	
77 F and 100 F, 168 Hr.	passes
Neutralization No.	
ASTM D 974	
Total Acid No.	0.53
pH Value (x)	8.8
Emulsion Test (x)	
1 Part Oil; 9 Parts Synthetic	
Hard Water	
Froth, 15 Min.: Ml.	nil
Separated Oil, 72 Hr.: %	trace
1 Part Oil; 9 Parts Synthetic	
Hard Water; 10 Parts Methyl Alcohol	
Froth, 15 Min.: Ml.	nil
Separated Oil, 72 Hr.: %	1.8

(x) Method described in the latest issue of MIL-C-4339 Specification

Ask the pro from Gulf



Gulf Oil Corporation
P.O. Box 1563
Houston, Texas 77001

Mobilmet 100

104, S-122, S-123, S-125, S-127, 160

SOLUBLE OILS

Emulsions of water and cutting oil are used widely in cutting and grinding operations, particularly where enhanced cooling is needed. The emulsion is normally able to absorb more heat and cool the part and the tool without the formation of excess smoke or oil mist.

Under normal circumstances mineral oils and water are not miscible. When they are mixed together, the water will ultimately settle out. The action of emulsifying agents enables the oil and water components to mix together to form stable emulsions which will not separate out into layers of oil and water. The Mobilmet 100 series products is supplied as a neat soluble oil which is a complex product containing many types of additives selected for specific purposes and blended in controlled proportions to rigid formulations.

Water soluble cutting oils are usually classified in one of three classes: 1. Light Duty which is a class of cutting oil containing only emulsifiers and coupling agents; 2. Moderate Duty which is an oil containing soaps, sulfonates, coupling agents and effective stabilizers for controlling objectionable odor formation; 3. Heavy Duty which is somewhat similar in formulation to the Moderate Duty type but has additional extreme pressure additives and may contain sulfurized fats, chlorine, and even oiliness additives. The Mobilmet 100 series products fall in the Moderate and Heavy Duty classes according to the following descriptions.

Mobilmet 104 is a Moderate Duty general purpose water soluble cutting oil. It contains a rust inhibitor. When emulsified, it is white in color and opaque on the workpiece. It is a multi-metal cutting and grinding fluid and is recommended for all ferrous and non-ferrous types. It can be used satisfactorily for the machining of dissimilar metal or where junctional corrosion is of concern.

Mobilmet S-122 is a Moderate Duty general purpose type of water soluble cutting oil that is used with normal water hardnesses that may be up to 300 ppm of hardness. This (normal water hardness) emulsion will be a very stable, homogeneous mixture that may be used on both ferrous and non-ferrous metals in all general types of machining operations including grinding, turning, drilling, milling, etc. The product is classified as a non-staining product and as noted is suitable for use on non-ferrous metal operations.

Mobilmet S-123 is a Moderate Duty general purpose water soluble cutting fluid very similar to Mobil S-122 in that it is used in normal water hardness conditions and on general machinery operations on both ferrous and non-ferrous metals and is a non-staining product. The Mobilmet S-123 does have a much greater amount of anti-rust additive and gives improved rust protection to both machines and machined parts.

Mobilmet S-125 is a very Heavy Duty type of water soluble cutting fluid designed for use in difficult machining operations on ferrous and exotic metals. It will cause staining and its use should be limited to ferrous and exotic metals only.

Characteristic	Mobilmet 104	Mobilmet S-122	Mobilmet S-123	Mobilmet S-125	Mobilmet S-127	Mobilmet 160
Gravity, API	19.7	20.2	18.0	13.6	19.4	11.6
Color, ASTM	3.5	6	5	Br.	8	Br.
Viscosity SUS at 100 °F	265	235	210	825	350	1200
Emulsion Test	Stable	Pass	Pass	Pass	Pass	Stable
Freeze Test	Pass	Pass	Pass	Pass	Pass	Pass

LUBRICATING OIL

(21)

BRAND NAME: SHELL IRUS FLUID F

TYPICAL PROPERTIES

CODE 65506		TEST METHOD	(02/77) SEWAREN	(02/77) SEWAREN
Gravity, °API 60F		D-1298-24	30.3-31.3	22.0-23.0
Color, ASTM (Visual)		O-Visu-01	Red-Orange	Yellow
Pour Point, °F.				
Flash, COC °F.				
Fire, °F.				
Viscosity, SSU @ 100°F.		D-0445-06	103-109	410-420
SSU @ 130°F.				
SSU @ 210°F.				
Viscosity, ASTM CS @ 100F		D-0445-59	-	88.4-90.6
Carbon Residue %w.				
Neutralization Value				
Cu Corrosion @ 212°F.				
Sulfur, %W		O-XYRay-01	0.14-0.16	0.084-0.96
Water, %W		D-0095-00	-	39.0-39.4
rust Test (6Hr. Mod.) Liquid		D-0665-03	-	Passes
rust Test (6Hr. Mod.) Vapor		D-0665-04	-	Passes
Centrifuge 1 Hr, 1800RPM Vis Dif		W-CNFG-01	-	27-29
Centrifuge 1 Hr, 1800RPM Fr Water		W-CNFG-02	-	0.05
Centrifuge 1 Hr, 1800RPM Sediment		W-CNFG-03	-	Trace
Ethylene Glycol, %V		G-LC00-22	-	1.6-1.7
Water + Glycol, %V		D-0095-04	-	39-40
Barium, %W		O-XYRay-02	0.23-0.25	0.138-0.150
Chlorine, %W		O-XYRay-11	0.13-0.15	0.078-0.10
Phosphorus, %W		O-XYRay-05	0.07-0.08	0.042-0.048
Zinc, %W		O-XYRay-04	0.076-0.080	0.040-0.048
Flash - PMCC, Deg F		D-0093-00	280	
Viscosity, CS @ 40 C (140F)		D-0445-95	20.4	78.8
			Oil Phase	Emulsion
			Typicals	Typicals

REMARKS:

Copied for

Jim Johnson
Chuck Hummel

Bud Swank

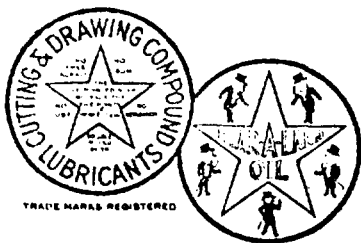
Gene Cunningham ✓
File

6-21-77

W.D. Durkinn

BRAND NAME: SHELL PELLA OIL A (FORMERLY PELLA 911)

REMARKS:



62
ADDRESS ALL CORRESPONDENCE
TO MAIN OFFICE
215-567-7453

G. WHITFIELD RICHARDS CO.

1724-1736 CARLTON STREET AND 1725-1737 WOOD STREET

Philadelphia, Pa. 19103

Perfected "LUBE-WELL" - Cutting Compound
"GRINDWELL" - Grinding Compound
"LUBRO-B. B." - Wire Drawing Compound
"LUBE-A-TUBE" - Drawing Compound
"QUENCHWELL" - Quenching Oil
"NONESUCH" - Soluble Oil
"FRIGIDOL" - Cutting Oil
"BRITE-WIRE" - Grease
"NEAR-A-LARD" - Oil

July 25, 1977

Cerro Copper & Brass Products
Highway #3
Sauget, Illinois 62001

Attention: Mr. Dave Durham

Dear Sir:

As per your telephone conversation with the writer of June 16, 1977,
we are listing on the attached sheet, the products which you have
been evaluating from us together with their flash points.

Yours truly,

G. WHITFIELD RICHARDS CO.

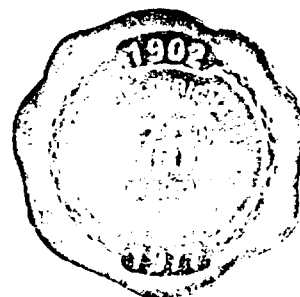
PER

Saul W. Klasky
SAUL W. KLASKY

SWK:sz

Attachment

copied for:
Jim Johnson
Bert Swank
Chuck Hummel
Dave Cunningham
7-27-77



METAL CUTTING AND DRAWING LUBRICANTS THAT LEAD THE WORLD

CERRO COPPER & BRASS PRODUCTS

SAUGET, ILLINOIS

FLASH POINTS

LUBE-A-TUBE P-90-X COMPOUND	352°F
LUBE-A-TUBE P-90-T COMPOUND	374°F
LUBE-A-TUBE P-96 COMPOUND	322°F
LUBE-A-TUBE P-97 COMPOUND	156°F

G. WHITFIELD RICHARDS

22

PHONE:
(216) 543-9845

ETNA PRODUCTS, INC.

16824 PARK CIRCLE DRIVE
CHAGRIN FALLS, OHIO 44022 U.S.A.

MAILING ADDRESS
P.O. BOX 286
CHAGRIN FALLS, O.
44022 U.S.A.

June 16, 1977

Division Cerro Marmon Corporation
Cerro Copper Products
P. O. Box 681
East St. Louis, Illinois 62202

Attention: Mr. Dave Durham

Dear Mr. Durham:

Confirming your conversation with Betty Breckenridge, the following are the Flash Points on the products you purchase:

	<u>FLASH POINT</u>
MASTER DRAW #558-SC	370° F. min.
MASTER DRAW #558-SC Reclaim	370° F. min.
MASTER DRAW #2555-G	365° F. min.
MASTER DRAW #2555-P	365° F. min.
MASTER DRAW #595-P	340° F. min.
MASTER DRAW #595	340° F. min.

If you have any questions, please contact us.

Very truly yours,

ETNA PRODUCTS, INC.

Frances Stone

Frances Stone,
Secretary

*Copied for
P. Tandler
D. Johnson
C. Stimmer
H. Cunningham
J. K. S.
6-20-77*



THE MOGUL CORPORATION

WATER TREATMENT PRODUCTS AND SERVICES SINCE 1915

P. O. BOX 200 • CHAGRIN FALLS, OHIO 44022 • (216) 247-5000 • TELEX NUMBER 985-626

May 1, 1984

Dear Customer:

Your Mogul representative recently reviewed the Mogul Saf•T•Fax Program with you. This important program is a special service of Mogul to help you comply with current government regulations and help provide an extra measure of safety for your personnel through proper handling of chemical products.

Your Mogul representative has requested that the attached Material Safety Data Sheets and Mogul Saf•T•Fax be forwarded to you. This information contains specific suggestions for appropriate general safety and handling procedures, including personal safety equipment information. Please review and plan to include in your safety program.

Thank you for the opportunity to be of service in the important area of personnel safety. We look forward to your continued business.

Best regards,

MOGUL, DIVISION OF DEXTER

James B. Wagner
Manager, Customer Services

MOGUL 164
EG-5522
AG-471
CL-631
WS-123

:psn



SAF•T•FAX

Safety and Handling Discussion

Mogul Material Safety Data Sheet Glossary of Terms

by D.L. Wilbur

INTRODUCTION

This glossary is provided as a part of Mogul's SAF•T•FAX program, an information service to assist in the proper handling, use and disposal of Mogul products. It should be consulted whenever you need help understanding technical terms in Mogul product Material Safety Data Sheets (MSDS's). Please take this opportunity to review Mogul MSDS's for products you are currently using, and use this Glossary as needed.

Too often users of chemical products are not fully advised of the potential hazards associated with product handling. We at Mogul take pride in our policy of providing very detailed information on our product MSDS's, including the most current safety and toxicological data on hazardous ingredients when available.

Our products are industrial strength chemicals that should be handled according to the MSDS's, using the recommended safety equipment. We want you to get all the benefits from the use of our products while practicing prudent industrial hygiene.

Some general guidelines for proper chemical handling: The two main routes of chemical exposure are skin/eye contact and inhalation of vapors, mists or dusts. Always wear protective eye equipment and impervious gloves when handling an industrial chemical. And use industrial chemicals in well-ventilated areas whenever possible. If products must be used in a confined space, use exhaust fans or protective respiratory equipment.

Mogul does not recommend any particular safety supply company for purchasing protective equipment. For possible suppliers near you, see the Safety Equipment and Clothing section of your Yellow Pages. Or, for your convenience, we have listed several nationally known safety supply companies that may be of help in your safety program.

Mine Safety Appliances Co. (412) 273-5000
General Scientific Safety Co. (215) 424-1550
Norton Co. (401) 943-4400
Safety Standard Equipment (213) 359-1440

Protect yourself. Know the potential hazards of the industrial chemicals with which you work and always adhere to the handling precautions.





IN CASE OF MEDICAL EMERGENCY, CALL COLLECT (412) 681-6669



MOGUL
DIVISION OF THE DEXTER CORPORATION

MSDS Glossary of Terms

A Material Safety Data Sheet (MSDS) can be defined as a document which provides pertinent information and a profile of a particular hazardous substance or mixture. This is an example of a Mogul product MSDS form: → → →

 MOGUL <small>DIVISION OF THE DEETER CORPORATION</small> <small>(216) 247-5000</small>		<small>NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)</small> <table border="1"> <tr> <td>HAZARD RATING</td> <td>Fire</td> <td>Reactivity</td> </tr> <tr> <td>4 = EXTREME</td> <td rowspan="5">  </td> <td rowspan="5"> Special </td> </tr> <tr> <td>3 = HIGH</td> </tr> <tr> <td>2 = MODERATE</td> </tr> <tr> <td>1 = SLIGHT</td> </tr> <tr> <td>0 = INSIGNIFICANT</td> </tr> <tr> <td colspan="3"> * = CHRONIC HEALTH HAZARD - SEE SECTION V </td> </tr> </table>		HAZARD RATING	Fire	Reactivity	4 = EXTREME		Special	3 = HIGH	2 = MODERATE	1 = SLIGHT	0 = INSIGNIFICANT	* = CHRONIC HEALTH HAZARD - SEE SECTION V		
HAZARD RATING	Fire	Reactivity														
4 = EXTREME		Special														
3 = HIGH																
2 = MODERATE																
1 = SLIGHT																
0 = INSIGNIFICANT																
* = CHRONIC HEALTH HAZARD - SEE SECTION V																
MATERIAL SAFETY DATA SHEET																
SECTION I																
CHEMICAL NAME AND SYNONYMS		TRADE NAME AND SYNONYMS														
CHEMICAL FAMILY		FORMULA														
SECTION II - HAZARDOUS INGREDIENTS																
MATERIAL	CAS #	%	TLV (OEL)													
SECTION III - PHYSICAL DATA																
BOILING POINT (°F)	SPECIFIC GRAVITY (H ₂ O=1)															
VAPOR PRESSURE (mm. Hg.)	PERCENT VOLATILE BY VOLUME (%)															
VAPOR DENSITY (AIR = 1)	EVAPORATION RATE (_____ = 1)															
SOLUBILITY IN WATER	pH															
APPEARANCE AND ODOR																
SECTION IV - FIRE AND EXPLOSION HAZARD DATA																
FLASH POINT (Method Used)		FLAMMABLE LIMITS	LEL UEL													
EXTINGUISHING MEDIA																
SPECIAL FIRE FIGHTING PROCEDURES																
UNUSUAL FIRE AND EXPLOSION HAZARDS																
SECTION V - HEALTH HAZARD DATA																
THRESHOLD LIMIT VALUE																
EFFECTS OF OVEREXPOSURE																
EMERGENCY AND FIRST AID PROCEDURES																
FOR MEDICAL EMERGENCY CALL COLLECT (412) 681-6669																
Page 1		(continued on reverse side)														

SECTION I

Contains the chemical name or generic description of the product, the product name, and the use of the product.

SECTION II - HAZARDOUS INGREDIENTS

This section lists any hazardous ingredients in the product, the Chemical Abstract Service number, weight percent and Threshold Limit Value or any other applicable exposure limits.

SECTION III - PHYSICAL DATA

This section lists known physical properties including the boiling point, vapor pressure, vapor density, solubility in water, appearance and odor, specific gravity, percent volatile by volume, evaporation rate, and pH.

SECTION IV - FIRE & EXPLOSION HAZARD DATA

This section contains the flash point and flammable limits of the product (if applicable), extinguishing media, special fire fighting procedures, and unusual fire and explosion hazards.

SECTION V - HEALTH HAZARD DATA

This section provides the Threshold Limit Value, as well as effects of over-exposure. The emergency phone number for the National Poison Control Network is also listed here. It is (412) 681-6669.

The Mogul Corporation

SECTION VI - REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE		
INCOMPATIBILITY (Materials to avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR		
SECTION VII - SPILL OR LEAK PROCEDURES			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED			
WASTE DISPOSAL METHOD			
SECTION VIII - SPECIAL PROTECTION INFORMATION			
RESPIRATORY PROTECTION (Specify type)			
VENTILATION	LOCAL EXHAUST		SPECIAL
	MECHANICAL (General)		OTHER
PROTECTIVE GLOVES		EYE PROTECTION	
OTHER PROTECTIVE EQUIPMENT			
SECTION IX - SPECIAL PRECAUTIONS			
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING			
OTHER PRECAUTIONS			
FOR MEDICAL EMERGENCY CALL COLLECT (412) 681-6669			
All statements, information and data given are believed to be accurate and reliable as of the date hereof, but are presented without guaranty warranty or responsibility of any kind, expressed or implied on our part. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other or additional considerations. Information regarding the proper course of treatment in the event of an accident or misuse of this product is properly the domain of the attending physician.			
Page 2 Printed in the U.S.A.		OSHA	

SECTION VI - REACTIVITY DATA

This section describes the stability of the product, including incompatibility (materials to avoid) and hazardous decomposition products.

SECTION VII - SPILL OR LEAK PROCEDURES

This section outlines steps to be taken in case the product is released or spilled, as well as disposal methods. This section addresses whether or not the product qualifies as an EPA hazardous waste.

SECTION VIII - SPECIAL PROTECTION INFORMATION

This section supplies protective equipment information including respirators, ventilation, protective gloves and eye protection.

SECTION IX - SPECIAL PRECAUTIONS

This section describes precautions to be taken in handling and storing the product and any other precautions recommended for safe use of the product.

MSDS Glossary of Terms

ACGIH:	American Conference of Governmental Industrial Hygienists.
ACUTE EXPOSURE:	Applies to symptoms which rapidly follow a sudden exposure to large doses of a hazardous material, without implying degree of severity.
BOILING POINT:	The temperature at which a liquid changes to a vapor state at a given pressure; usually stated in degrees Fahrenheit (°F) at sea level pressure of 760 millimeters (mm) of mercury (Hg). For mixtures, the initial boiling point or the boiling range may be given.
CAS NUMBER (#):	Chemical Abstract Service registry number.
CFR:	Code of Federal Regulations. The U. S. regulations issued by governmental agencies such as OSHA, EPA, FDA and DOT, to enforce Acts of Congress. Note: 29CFR1910 denotes Title 29 of the Code of Federal Regulations, part 1910.
CARCINOGEN:	A chemical that has been shown to cause cancer in laboratory animals and/or man. A "suspect carcinogen" or "potential carcinogen" has been shown to cause cancer only in laboratory animals, and has not been linked with cancer in humans. Potential carcinogens are listed by the National Toxicology Program, the International Agency for Research on Cancer, or by OSHA, and referenced in the NIOSH <i>"Registry of Toxic Effects of Chemical Substances."</i>
CHRONIC EXPOSURE:	Applies to symptoms which occur over a period of months or years due to exposure to low level sublethal concentrations, without implying degree of severity.
COMBUSTIBLE:	A liquid with a flash point at or above 100°F (37.8°C), but below 200°F. (See flash point.)
CORROSIVE:	A chemical that causes a visible destruction of skin and other tissue.
DOT:	U. S. Department of Transportation.
DERMAL:	Skin, through the skin.
EPA:	U. S. Environmental Protection Agency.
EP TOXICITY:	Extraction Procedure toxicity, as defined by EPA hazardous waste regulations, 21 CFR 261.24.
EVAPORATION RATE:	The rate at which a particular material will vaporize (evaporate) when compared to the rate of vaporization of a known material, usually butyl acetate. If another known material is used for comparison, that information shall be provided.
EXPLOSIVE LIMITS:	<p>The range of concentrations over which a flammable vapor mixed with proper proportions of air will flash or explode if an ignition source is present.</p> <p>The range extends between two points designated lower explosive limit (LEL) and the upper explosive limit (UEL) and are expressed in percent of volume of vapor in air.</p>

FLASH POINT:

The lowest temperature in degrees Fahrenheit (°F) at which a liquid will give off enough flammable vapor to ignite. Since flash points vary according to how they are obtained, the method used must be listed. The methods used most extensively include: Tag Closed Cup (TCC); Pensky-Martens Closed Cup (PMCC); and Setaflash (SETA).

**HAZARDOUS
DECOMPOSITION
PRODUCTS:**

A list (if any) of the hazardous materials that may be produced in dangerous amounts if the subject material is exposed to burning, oxidation, heating or allowed to react with other chemicals.

**HAZARDOUS
INGREDIENT:**

By definition, a hazardous ingredient is a substance or form of a substance in mixture, in sufficient concentration to produce a flammable vapor or gas, or to produce acute or chronic adverse effects in persons exposed in normal use or predictable misuse of it. These include but are not limited to substances listed in 29CFR1910.1000, Tables Z-1, Z-2, and Z-3, the ACGIH list of TLV's and any confirmed or suspect carcinogens, toxics, corrosives, as well as any combustible liquid, compressed gas, explosive, flammable, organic peroxide, oxidizer, pyrophoric, unstable (reactive) or water reactive chemical.

HAZARDOUS WASTE:

A waste that meets defined chemical characteristics (ignitability, corrosivity, reactivity, or EP toxicity) or consists primarily of chemicals listed in EPA regulations at 40CFR261.20 - 261.33. These regulations are written to enforce the requirements of the Resource Conservation and Recovery Act.

IDLH:

Immediately dangerous to life or health.

IGNITABLE:

As defined by EPA hazardous waste rules, a material that has a flash point less than 140° F (PMCC), or is a DOT oxidizer.

IMPERVIOUS:

Not able to be penetrated by, for example: rubber gloves are impervious to water.

INGESTION:

The eating or drinking of a substance.

INHALATION:

The breathing in of vapors, gases, mists, aerosols, fumes and/or dusts.

IRRITANT:

A chemical which causes a reversible inflammatory effect on living tissue (like a skin rash).

LC₅₀:

The lethal concentration to 50% of test animals. For air breathing animals: The concentration of a chemical in air which is required to produce death in 50% of exposed test animals. For aquatic animals (i.e. fish): The concentration of a chemical in water which kills 50% of the organisms.

LD₅₀:

The lethal dose to 50% of test animals. The dose which is required to produce death in 50% of exposed test animals; usually oral and dermal routes and test animals are specified (i.e., Oral LD₅₀ (rat); Dermal LD₅₀ (rabbit)).

MSDS:

Material Safety Data Sheet, as required by OSHA under Title 29 of the Code of Federal Regulations 1910.1200.

MSDS Glossary of Terms

MUTAGEN:	A chemical that has been shown to cause changes in the genetic material (DNA) in offspring of bacteria or laboratory animals.
NARCOSIS:	A condition of deep stupor which passes into unconsciousness and paralysis.
NFPA:	The National Fire Protection Association, a professional association that assigns a rating to a chemical substance to give a general idea of the inherent hazards of a chemical under emergency conditions such as fires, spills and leaks. The NFPA rating is the diamond shaped diagram in the upper right hand corner of the Mogul MSDS's. It is a required designation under a number of state and local "Right to Know" Acts. The NFPA code on Mogul products which are mixtures, are estimates of how the product will behave, based upon the individual behavior of ingredients.
NIOSH:	National Institute of Occupational Safety and Health of the U. S. Department of Health and Human Services (was Department of Health, Education and Welfare).
NPCN:	The National Poison Center Network, a special service that you or your doctor can call in the event of an exposure to a chemical substance. Call collect (412) 681-6669.
NUISANCE PARTICULATES:	Dusts or other fine solids that are nuisances to the respiratory tract.
OSHA:	Usually refers to the Occupational Safety and Health Administration but sometimes is used for the Occupational Safety and Health Act.
OXIDIZER, OXIDIZING AGENTS:	A compound that evolves oxygen spontaneously at room temperature or with slight heat and therefore can cause fires in the presence of a burnable substance (straw, oils, wood, etc.). Examples are hypochlorites, peroxides, nitrites, and nitrates.
PEL:	Permissible exposure limit as required by OSHA regulation 29CFR-1910.1000(e) Tables Z-1, Z-2, and Z-3. Generally TLV's are more protective than the OSHA PEL's, and thus are recommended.
PMCC:	Pensky-Martens closed cup method for determining flash point.
% (PERCENT):	Units of hazardous ingredient per 100 units of product, expressed in weight on Mogul MSDS's.
PERCENTAGE VOLATILE BY VOLUME:	The percentage of a liquid or solid (by volume) that will evaporate at an ambient temperature of 70 degrees Fahrenheit (°F).
PYROPHORIC:	A chemical that ignites in air at or below 130° F.
RCRA:	Resource Conservation Recovery Act, a law enforced by EPA, governing the disposal of hazardous wastes.
REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES:	A reference published by NIOSH which summarizes toxic characteristics of certain chemicals.

**SELF-CONTAINED
BREATHING APPARATUS:**

Protective equipment that supplies fresh air to the user, not filtered air as with a respirator.

SENSITIZER:

A chemical capable of eventually causing an allergic reaction to some individuals. If the first exposure does not cause a reaction, but subsequent exposures do, an individual has become sensitized.

SETA:

Setaflash method for determining flash point.

(SKIN):

This notation, when presented in the TLV column designates a chemical that can be absorbed by the skin, so appropriate measures should be taken (i.e., use of rubber gloves, long sleeved shirts, etc.) to minimize the potential for skin absorption so the TLV is not exceeded.

SPECIFIC GRAVITY:

The ratio of the weight of a volume of material to the weight of an equal volume of water at 39.2 degrees Fahrenheit (°F).

TCC:

Tag (Tagliabue) closed cup method for determining flash point.

TLV OR TLV-TWA:

The Threshold Limit Value as recommended by the American Conference of Governmental Industrial Hygienists. Usually expressed as a time-weighted average (TWA), it is the concentration of a chemical in air (as vapor, mist, etc.) to which workers can be exposed for a normal eight hour workday, 40 hours a week, without experiencing adverse effects. Refer to entry on (SKIN) for additional information on certain chemicals.

TLV-C OR TLV CEILING:

The workplace concentration of chemical in air that should not be exceeded even instantaneously.

TLV-STEL:

The workplace concentration of a chemical in air (as vapor, mist, etc.) to which workers can be exposed continuously for a 15 minute period of time without suffering from: 1) Irritation, 2) chronic or irreversible tissue damage, or 3) narcosis, provided the TLV-TWA is not exceeded. Exposures at the STEL should not be repeated more than four times per day and there should be a minimum of 60 minutes between STEL exposures.

TOC:

Tag (Tagliabue) open cup method for determining flash point.

TERATOGEN:

A chemical that has been shown to cause birth defects in laboratory animals.

THRESHOLD LIMIT VALUE:

See TLV.

VAPOR PRESSURE:

The pressure exerted by a saturated vapor above its own liquid in a closed container, usually stated in milliliters (mm) of mercury (Hg) at 68 degrees Fahrenheit (°F) or 20 degrees Celsius (°C).

VISCOUS:

Thick liquid, like syrup.

What Mogul's SAF•T•FAX Service Provides:

- A Mogul representative visits to review current safety procedures with respect to Mogul products.
- Specific recommendations are made concerning product handling.
- A confirming letter with required OSHA Material Safety Data Sheets and other recommended informational materials is sent to the Mogul customer.
- Assistance with training of employees can be provided by the Mogul representative.

Where Can You Find Product Safety Information?

- Product labeling displayed on drum containers
- Material Safety Data Sheets
- Mogul sales representative
- In case of medical emergency call collect: (412) 681-6669 — National Poison Center Network.

Mogul Material Safety Data Sheet

National Fire Protection Association (NFPA) Code

- I Product Ingredients
- II Hazardous Ingredients
- III Physical Data
- IV Fire & Explosion Hazards
- V Health Hazard Data
- VI Reactivity Data
- VII Spill or Leak Procedures
- VIII Special Protection Information
- IX Special Precautions

Emergency medical information.
Phone collect (412) 681-6669.

Emergency medical information.
Phone collect (412) 681-6669.

PLANTS AND OFFICES

Corporate Offices
P. O. Box 200
Chagrin Falls, Ohio 44022
(216) 247-5000

Central Division
8227 E. Washington St.
Chagrin Falls, OH 44022
(216) 247-4000

Eastern Division
480-B Hayden Station Rd.
Windsor, CT 06095
(203) 688-7276

Midwest Division
1415 Davis Rd.
Elgin, IL 60120
(312) 888-3382

North Central Division
7541 Commerce Lane N.E.
Minneapolis, MN 55432
(612) 571-8900

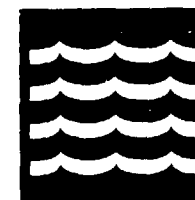
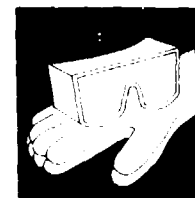
Northwest Division
6650 N. Basin St. Suite 5
Portland, OR 97217
(503) 285-0248

Southern Division
P. O. Box 31756
Charlotte, NC 28203
(704) 375-5726

Southwest Division
609 112th St.
Arlington, TX 76011
(817) 265-4206

Western Division
3030 N. 30th Ave.
Phoenix, AZ 85017
(602) 272-1353

SAF•T•FAX™



Product Safety and Handling Information Service



MOGUL

DIVISION OF THE DEXTER CORPORATION
EXECUTIVE OFFICES CHAGRIN FALLS, OH 44022

OSHA Regulations

New OSHA hazard communication rules now require that chemical suppliers provide safety and handling information to employers for employees using chemicals. This is often referred to as an employee "right-to-know" regulation.

Manufacturing employers are required to provide employee training on chemical handling. Training is simplified when product Material Safety Data Sheets provide detailed handling information, and when experienced Mogul sales representatives can assist in the understanding of the information.

Additionally, there are a number of state and local "right-to-know" acts that require safety and handling information be supplied to all chemical users, including institutional and commercial establishments.

Regardless of these requirements, we recommend that all our customers be aware of information that assures the safe handling of industrial chemicals. The more you exercise your right-to-know about the products you use, the better your chances of avoiding chemical-related accidents and injuries.

Right-To-Know

Your "right-to-know." Mogul believes in it. That is why we established our long-standing policy of providing current safety and handling information via special hazard warning

letters, complete labeling, computerized information services, thorough Material Safety Data Sheets, and our special SAF•T•FAX™, even before it was required by OSHA. We take pride in this policy, and we urge you to exercise your "right-to-know" about all industrial chemicals you handle, no matter who supplies them.

Mogul products, in general, are no more or less hazardous than other industrial chemicals supplied for water treatment or similar uses, but we believe it is best to completely inform every person who might handle our products of the potential hazards which may be encountered if materials are spilled, mishandled, or improperly stored or disposed. Microbiocides, acids, alkalies, oxidizers and fuel additives all require special handling considerations.

Our sales representatives are trained to advise you of additional equipment which can be provided to minimize exposures and maximize plant safety. With the help of our trained sales representatives, the use of appropriate product Material Safety Data Sheets and our "Mogul Material Safety Data Sheet Glossary of Terms," we think you will find your obligation for employee training simplified.

To better serve your needs and meet our Mogul quality service obligation, we have developed SAF•T•FAX, a product information service to ensure that appropriate safety and handling information is provided to you.



MOGUL

Customer Benefits

- Most current and up-to-date information
- Emergency and first aid information
- Access to the National Poison Center Network (NPCN) where all Mogul products are registered.
- Waste disposal information
- Firefighting information
- Recommendations on protective equipment for product handling

Examples of Recommendations

During your review with your sales representative some typical safety recommendations may be for you to:

- Review OSHA Material Safety Data Sheets with employees.
- Require protective equipment, such as rubber gloves and goggles.
- Consider implementing feed control equipment to minimize personal contact.

Your specific product handling recommendations are kept on file at Mogul and will be updated as required by OSHA and other regulatory agencies.



TM

**SAF • T • FAX**

General Safety and Handling Procedures

Information on Safety Practices

The objective of this Saf • T • Fax is to set general guidelines for safety during chemical handling operations.

Treat all chemicals as if they were hazardous

BUT

Any chemical can be handled safely if you follow these simple precautions.

GENERAL PROCEDURES

- | | |
|---------------|--|
| FIRST | Read the label and Material Safety Data Sheet for detailed handling information.
ASK YOUR SUPERVISOR if the chemical is new to you OR if you have questions about safe handling. |
| NEVER | Smoke while you work with chemicals
Eat while you work with chemicals
Touch or swallow chemicals
Wipe skin or eyes with hands or cloth that has contacted chemicals
Wear contact lenses while working with chemicals |
| ALWAYS | Protect your eyes (splash proof goggles, face shield)
Wear rubber or plastic gloves/apron and boots if required
Know where the nearest safety shower, eye wash station or hose station is located |

EMERGENCY PROCEDURES

- | | |
|------------------|---|
| FIRST AID | Eye contact — immediately flush with water for 15 minutes. Call physician.
Skin contact — flush with water for 15 minutes. Call physician.
Inhalation — remove from exposure to fumes. Call physician.
Clothing contact — immediately remove contaminated clothing and shoes AND wash before re-use. (Separately from regular laundry.)
ALERT YOUR SUPERVISOR.
In Case of Medical Emergency Call Collect (412) 681-6669 for assistance or direction. |
| SPIILLS | Avoid breathing fumes.
Alert co-workers and supervision
Wear protective equipment
Cover with inert absorbent material, contain spill and consult product label and Material Safety Data Sheets |

(See reverse side for additional details)



MOGUL

DIVISION OF THE DEXTER CORPORATION
EXECUTIVE OFFICES — CHAGRIN FALLS, OH 44022

New 2/84 STC-6
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WORKING APPAREL

- For most work, long sleeve shirts, with buttons that close at the neck and wrists are recommended.
- Safety shoes with low, broad heels and stout soles should be worn unless specific conditions call for special foot gear.
- If climbing is required, non-skid soles should be worn.
- If work must be performed on machinery or other moving parts, short sleeves are preferred.
- Finger rings, key chains, tags, or watch chains should not be worn when working on machinery.

SPECIAL SAFETY CLOTHING AND DEVICES

- Safety hats — approved safety hats must be worn on all jobs and in areas away from the job itself where falling objects are possible.
- Safety goggles — monogoggles — these must be worn on all chemical jobs and also, especially, when adding chemicals.

In addition, goggles should be worn when:

1. Excessive dust and chemical mists are present, both wet and dry.
2. Splashing of wet chemical may occur.
3. Handling drummed or bagged chemicals.

- Face shields — face shields must be worn when:

1. Loading chemicals into vats or tanks
2. High pressure water blasting

Splash proof goggles should be worn as backup to these shields.

- Respirators — employees exposed to dry chemicals or excessive dust of any type, and those exposed to organic vapors should use some type of respirator. There are many types available; be sure to use proper type for the work being done.